Claudius Ptolemy

The Phases of the Fixed Stars

Translated by Robert Schmidt
Edited by Robert Hand

Project Hindsight
Greek Track
Volume III

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Introduction to Ptolemy's *Phases*
by
Robert Hand

This is not standard astrological material. There is nothing about horoscopy in it. However, it is important to astrologers for several reasons. First of all, it is the basis of the fixed star methodology of the ancients, which can be seen exemplified in the Anonymous of 379's *Treatise on the Bright Fixed Stars*[1]. That methodology should be examined very closely in modern work on fixed stars.

Second, we have here an astrology that appears to be native to the Greek speaking world. It is not heavily influenced by Babylonian astronomy. Though with Ptolemy's rendition of it we can be sure that elements have come in from other peoples, because he cites a number of traditions and authors as the basis of his statements. This kind of astrology, based on the phases of the stars and planets with respect to the Sun, and from which is derived a collective rather than personal correlation between celestial and terrestrial events, is to be found all over the world among all peoples. It is non-horoscopic and mundane. There is no need to look for origins either in Mesopotamia or any other single source. We find this kind of astrology among the Chinese, the ancient Northern Europeans, Native American peoples, especially Meso-Americans, and the peoples of the Indian subcontinent as well as the Greeks. Sometimes it is applied to weather, as it is here, sometimes to the affairs of the kingdom. The astrology that appears in the *Vedas* is this type of astrology. It is probable that this is the sort of thing that was practiced at Stonehenge.

Third, specifically related to this work, we see a fully worked out set of techniques by which the ancients did the kind of long-range weather forecasting that we see in our popular almanacs. This may serve to give us a great deal more information about the intrinsic nature of the fixed stars than we can get simply from their traditional use as horoscopic indicators.

Fourth and by no means last, the *Phases* gives us fully worked out material about what the phases of the stars and planets are with respect to the Sun. This knowledge is important because it relates to the entire issue of oriental and occidental, matutine and vespertine which we now

[1] Project Hindsight, Volume II-A, Greek Track.

know is related to the sect of planetary placements. These matters have been the source of much confusion in the writings of later astrologers, particularly those of the renaissance.

Modern Use of the Tables

There is a major problem concerning the direct use of the material given in the *Phases.* The calendar portion can be used to derive hypotheses concerning the interpretations of the various stars, but it cannot be used directly without complete recalculation for dates and latitudes. The precession of the equinoxes has changed not only the dates of the risings and settings of the fixed stars, but also the geographic latitudes at which the risings and settings happen. With ecliptic coordinates only the longitudes change greatly with precession. The latitudes are almost fixed[1]. However, stellar phases are determined by the equatorial coordinates of stars, right ascension and declination. Both of these, right ascension and declination, change tremendously as the result of precession. The following table, giving the celestial longitudes, latitudes, right ascensions and declinations of Aldebaran for the years 200 C.E. and 2000 C.E., will serve to illustrate how great these changes are.

Aldebaran – Jan. 1, 200			
Right Asc.	Declination	Longitude	Latitude
43°53'53"	11°N 3'47"	14°Ta43' 3"	5°S35'34"

Aldebaran – Jan. 1, 2000			
Right Asc.	Declination	Longitude	Latitude
68°58'48"	16°N30'33"	9°Ge47' 7"	5°S28' 3"

Notice that the celestial latitude has changed only by 0°7'31" in 1800 years, while the declination has changed 5°26'46", in the same time period. Other stars will exhibit more or less change but of the same order of magnitude. At some point we hope to create modern tables which will give modern data on star phases so that these methods can

[1] There is some small change of latitude due to both proper motion and the very slow rotation of the ecliptic plane itself. But it is on the order of a few minutes per millenium, rather than minutes per century.

be used for experiment by modern astrologers.

We have decided to append onto the end of this volume a translation of Book VIII, chapter 4 of the *Almagest.* This contains a discussion of the phase relationships of stars to the Sun that is somewhat different from the one that we find in the *Phases*. The principle difference is that the phases in the *Almagest* include both the apparent phases as well as all of the *true phases*[1] (in the sense that Ptolemy defines them with the Sun and the star actually on the horizon or the meridian at the time of the phase). This section is the basis of parans as modern astrologers use them. We are using Ashmand's translation for the present. But when we issue the second and finished translation of this work, we will append a translation by Robert Schmidt which will be more stylistically consistent with the main body of the *Phases* than is the Ashmand translation.

Note — All of the footnotes in this book, except for those in sections clearly written by your editor, are by the translator, Robert Schmidt, unless initialed RH in square brackets. [RH] indicates a note entered by your editor.

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[1] See **General Note** under *phasis*.

Translator's Preface
by
Robert Schmidt

The Possible Relation of Stellar Phases to Greek Philosophy

Throughout the ancient world, the heliacal setting and rising of a celestial body was, itself, a matter of great moment, and corresponded to the moments when important matters occurred in our world. Being the periods when the celestial body disappeared from sight under the rays of the Sun, and then reappeared, the heliacal setting and rising was sometimes regarded as the death and rebirth of that body. Astrologically speaking, one would expect significant events to occur at such times, events which were consistent with the death/rebirth symbolism.

The phenomena of heliacal rising and setting also seem to have worked their magic upon the minds of the very first Greek thinkers long before the Greeks themselves had a distinct astrological doctrine, or, for that matter, any distinct sciences at all. We are referring to the time of the Pre-Socratic philosophers, when the fundamental concepts of all Western thought were first being formulated.

We maintain that our original understanding of time, language, and of a supersensible realm were all influenced by this phenomenon. In this preface we will only give some brief indications of how it obsessed the minds of those early thinkers.

The very earliest fragment of Western thought may have it in mind. It is attributed to the Pre-Socratic philosopher Anaximander, and reads as follows:

> "The place from which things come to be, there also must they pass away according to necessity. For they must pay penalty to each other for their injustice, according to the ordering of time."

This utterance seems to be making a poetical statement about the impermanence of things. Why should we connect it with celestial phenomena at all? Because for the early Greeks, time is the numbering and ordering of a *particular* motion—namely, that of the heavens. This is the gist of an explicit definition of time by the late Pythagorean, Archytas of Tarentum, a friend of Plato's. It is a commonplace that the Pythagoreans did not separate number from sensible things. Nor,

evidently, did they separate time—that is, the *number* of the heavenly motion—from the heavens themselves.

In our modern sophistication, it is hard for us to keep in mind such a concrete definition of time. For the early Greeks time is not a universal framework in which things happen. Nor is it identical with change generally. It does not flow equably from past into future, as Newton claimed. It is the numbering and ordering of the motion of the heavens, purely and simply.

This is so important that it deserves to be repeated. Time was not down here on the earth. It was up there in the heavens. And just because mundane things change did not mean that they are "in time." Mundane matters were only "in time," or belonged to time, because their changing was in accord with the ordering and numbering of the celestial motion. Thus, we might say that the original view of time in the West was intrinsically astrological[1].

This means that for the early Greeks the structure and inner nature of time itself were found in the structure and proper divisions of the heavenly motions[2]. And in the numbering and ordering of the heavens, the "time" of concealment and arising—that is, the time after the star has heliacally set and before it heliacally rises—had a most conspicuous role. It represents Anaximander's source whence things come to be and whither they pass away. It is the true moment, the true now, the present

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[1] It is true that later philosophers modified this view. In the *Timaeus*, Plato speaks of a realm of being not subject to celestial time—an eternal realm of which the celestial time was but an imperfect sensible image. And on the other end of the spectrum, there is a realm of mere disordered and disharmonious change, not in accord with the ordering of the heavens—a shadowy realm that is thus also not "in time."

In an entirely different manner, Aristotle brought time "down to earth," and defined it in terms of local motions, but still as the numbering and ordering of those motions.

However, at the deepest level these new conceptions essentially remained true to the original "astrological" understanding of time, and it is still with us to this day, although very deep down in our thinking.

[2] We do not merely mean this in some general sense. It is actually possible to set up a one-to-one correspondance between the tenses of the Greek verb and the "moments" demarcated by the different phases of the stars. We will articulate this correspondance in detail in a later paper.

in the fullest sense. It is not some point on a number line, some limit case of ever smaller divisions of a temporal continuum. Just as *phasis* is a "manifestation at once definite and apparent", so the moment has a structure which can be articulated.

It seems to us likely that the pre-Socratic philosopher Heraclitus also had heliacal rising and setting in mind when he wrote:

> "The lord whose oracle is Delphi neither conceals (*kruptei*) nor reveals (*legei*) but only gives a sign (*sēmainei*)."

Now, the lord of the Delphic oracle was Apollo, the Sun god. And the verbs in this utterance are nearly the exact words used in describing the phenomena of heliacal rising and setting.

Astrologically speaking, the Sun gives signs (*episēmainei*) only when the star is heliacally rising or setting, not when it lies fully visible, and not when it is totally invisible. And in so far as the Sun is the source of illumination, its role in all this is somewhat paradoxical. When it brings its illumination close to the star, the Sun does not reveal it; instead the star goes into hiding (*kruptesthai*). And when the Sun withdraws its radiance, it does not conceal the star; instead, the star becomes visible (*epitellei*, *cf.* **General Note**) to our sense of sight.

Heraclitus may be saying that speech has the same paradoxical nature as the phenomenon of heliacal rising and setting. When we try to use it to reveal, the truth slips into hiding; when we try to use it to conceal or deceive, the truth inevitably shows itself. But in the oracular use of language, language on the very edge of concealment and manifestation, it is at least possible to give signs.

Heralitus was himself called "the Obscure" in antiquity, and Aristotle often deprecates the apparently contradictory character of his remarks. It is worth noting that Heraclitus compared himself to the Delphic oracle.

Finally, let us mention that, for Plato, the period during which the star is invisible behind the Sun seems to have been symbolic of the realm that is indeed invisible to our physical sense of sight, but may be reached through discourse (*logos*). The Sun being symbolic of the One and the Good, this is actually a realm of higher illumination and greater truth.

In the dialogue *Phaedo*[1], Plato has Socrates speak about those earlier inquirers into nature, who examined everything with their physical eyes alone. Socrates says that they are like those men who look directly at the Sun and are blinded by it. The implication is that the truth of things is too brilliant for a method of inquiry tied to the senses. Because of this, Socrates says that he decided to take the "second best attempt," and retreat into discourse (*logos*). We will pursue this a bit further in the upcoming **General Note** on *phasis*.

The Content of the *Phases*

The *Phases of the Fixed Stars* offers an explicit treatment of astrological weather prediction. In this work Ptolemy summarizes what appears to be a centuries-old tradition of correlating weather phenomena with the heliacal rising and setting of the fixed stars. This was not merely the practice of astrologers, but was taken seriously by most of the great astronomers from the time of Plato on, among them Eudoxus and Hipparchus. Their observations are actually still preserved in the daily register that accompanies Ptolemy's discussion.

Not all of the Greek astronomers, however, considered this practice to be legitimate. Geminus, for example, is critical of it in the last book of his *Introduction to Astronomy*. Ptolemy himself questions whether this method can yield accurate predictions of the weather. But, as is clear from the text itself, it is not because he has any doubts as to the influence of the fixed stars. It is because he thinks that they only act in the most general way, and usually but not always. If there were no competing causes, the fixed stars would in fact have just the effects that observation had discovered. But there are many other contributing causes, the most important of which are the effects of the planets themselves. Thus, it is not because he is any less an astrologer that he has reservations about this method, but because he is even more one.

[1] 96 ff.

The Role of the *Phases* in the Ptolemaic Corpus

The role of the *Phases* in Ptolemy's systematization of astronomical/astrological science is something of a puzzle. The work begins abruptly, as if in the middle of a discussion. The opening section refers to several matters as already having been discussed in a "special syntaxis of this treatise": 1) certain special observations that need to be made in the case of the phases of individual stars; 2) a theorem about the determination of co-rising, co-setting, and co-culmination; 3) a theorem about the distance of the sun from the star in heliacal rising or setting; 4) certain tables calculated for stars of the first and second magnitude on the basis of these two theorems for each of five latitudinal zones.

Some scholars have argued that this material was the subject of a missing first book to this treatise. However, it seems to us more likely that this material was originally part of Book VIII of the *Almagest*, and that the *Phases* itself constituted a subsequent book of that treatise.

The two theorems 2 & 3 mentioned above are quite unambiguously found at the end of Book VIII of the *Almagest*. Furthermore, detailed observations of the phases of individual stars answering to item 1 above are said by Ptolemy himself (Book XIII, Chapter 7) to have been part of his treatise on the fixed stars. Such observations are nowhere to be found in the *Almagest* as it stands, but presumably they were originally an integral part of Book VIII. Even apart from what he says, it would have been quite in order for him to have had a treatment analogous to that of the heliacal rising and setting of the planets in Book XIII, including tables such as those mentioned in item 4 above, which are also presently missing from Book VIII.

Furthermore, in its present state, Book VIII of the *Almagest* bears a greater resemblance to a collage than a systematic treatment, with an apparent lack of coherence, continuity, and the summaries and transitions typical of Ptolemy[1]. First of all, it is significantly shorter than the other books (except Book VII which also becomes suspect because of its connection to Book VIII). It begins with a catalogue of the stars in the southern sky (Book VII ending with a catalogue of the stars in the northern sky), proceeds with a relatively coherent narrative discussion

[1] For some unaccountable reason, Toomer in his translation of the *Almagest* singles out Book VIII as being particularly well-constructed!

of the constellational figures, turns to a discussion of the different kinds of figurations (i.e., aspects) that the stars can make with the planets and with the earth[1], makes a somewhat abrupt formal mathematical shift to the two theorems referred to above, and ends the book with a reference back to certain material that is evidently not discussed in the book as it stands (meteorological predictions made from individual cases of heliacal risings and settings), but which corresponds quite nicely to item 1 above. The material cited in the *Phases* would restore the integrity of this particular book.

In addition, in the *Phases* Ptolemy twice says that all that cited material has been dealt with in a special syntaxis of *this* treatise. Thus, we might infer that the *Phases* was originally an integral part of the *Almagest* itself, constituting another book that followed Book VIII. It must have been excised at some point, along with the detailed observations of phases (item 1), and the tables (item 4) which we surmise were originally part of Book VIII but are still missing.

Finally, we would like to recall that fact that the Anonymous of 379 C.E. referred to just such a table as item 4, from which he evidently derived the co-rising positions of approximately the same 30 stars that Ptolemy records in his *Phases*. But he also implies that this table contained other information connected with the astrological nature of these same stars. This may be a clue as to some of the other missing material from Book VIII.

Why was this done? Is part of Ptolemy's own (but apparently unfinished) revision of the *Almagest*? Is it the result of later editorial rearrangement, say, by Theon of Alexandria? Or was it deleted because it contained explicitly astrological material?

In a later article in the *ARHAT Journal*, we will attempt to reconstruct the original form of the treatise in more detail.

Ptolemy's Greek

Ptolemy is really very difficult to translate. The astrologers we have translated hitherto write in a kind of run-on style. But Ptolemy writes extremely complex sentences in which clauses are nested inside of clauses nested inside still other clauses—a style that does not easily lend

[1] See Appendix IV.

itself to English translation. To make matters even more difficult, he is very word conscious. His obvious philosophical sophistication makes it very difficult to take anything he writes lightly. We think that the distinction between true and apparent phases[1] is a case in point. We suspect that astronomical phenomenon are for him symbols of deeper philosophical and even ethical issues, and the study of astronomy is a path that may lead to human perfection[2].

Faced with this difficulty, we have broken up his enormous sentences as best we could, though always trying use other devices to preserve the subtle logical interconnections that are possible in his style of writing.

The translation of the *Phases* has been made from the Teubner edition edited by Heiberg. As far as we know, there are no translations of this work into any modern language.

Geminus' Calendar

As part of this volume we have also included the much shorter register that accompanies Geminus' *Introduction to Astronomy*[3] It is interesting because it is organized along different lines than Ptolemy's register. Where Ptolemy has the heliacal risings and settings recorded for every day of the Alexandrian calendar, the Geminus register has them recorded according to the zodiacal position of the Sun. This permits an interesting cross-check on the information and certain chronological issues. In the Ptolemy register, we have to infer the position of the Sun from calendrical considerations. In the Geminus register, we have to infer the exact day and year from astronomical considerations, and come face to face with the precession issue. Thus, the two registers complement one another.

The "Geminus" register has been translated from the Teubner edition edited by Manitius. Although never before translated into English, it is translated into German in the Teubner edition.

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[1] See **General Note** on *phasis*.

[2] See opening chapter of the *Almagest*.

[3] Probably not by Geminus himself.

phasis — phase. This abstract noun literally means an 'appearing' and derives from the fundamental Greek verb '*phainō*', meaning 'to appear.' Our English word 'phenomenon' comes from a participle of this verb. It is also the word translated as the 'phases' of the Moon, not in the sense of different moments in the lunar cycle, but in the sense of different and discontinuous modes of the appearing of the Moon. Our English word 'phase' has to some extent come to mean more a 'moment in a development' than an 'appearing.' We have nevertheless retained this word as our translation of *phasis*, hoping to rehabilitate the English word somewhat.

Ptolemy gives an interesting justification for the application of the word 'phase' to heliacal settings, which are in effect disappearances, and not appearances. In the course of his discussion, he gives the following definition: "appearing is the manifestation of a figuration at once definite and apparent." Under this criterion, heliacal settings can be correctly labeled 'phases' because they constitute the very last appearance of the star, and are thus fully definite.

What about the so-called "true phases?" Ptolemy does not himself offer a parallel justification for calling ecliptical co-risings "phases," although he seems to suggest that this would be possible. Such a justification is clearly necessary, because during a true phase the star does not appear at all, being directly conjunct with the Sun. We will try to read between the lines a little bit, keeping in mind Ptolemy's obvious philosophical training.

The basic Greek word for 'true' is '*alēthēs*'. In its most primitive sense, '*alēthēs*' simply means 'unconcealed.' Truth is unconcealment[1]. When it is opposed to the word '*phainomenos*' (apparent), the latter tends to take on the sense of 'spurious' or 'illusory.' In the traditional[2][2] discussion of true phases, however, the Greek uses another adjective derived from this, '*alēthinos*', which has the sense of 'full of

---

[1] It is the 20th century philosopher Martin Heidegger who most fully drew attention to this peculiar Greek notion of truth, and it is absolutely fundamental in his own philosophizing as well.

[2] These distinctions go way back at least to Autylocus of Pitane, 3rd/4th century B.C.E.

unconcealment,' 'genuine,' 'the real as opposed to the copy.' It would seem that the appearing of the apparent phases is but an image or copy of the deeper "appearing" found in true phases.

Evidently, the moment when the body becomes invisible to our physical sense of sight is here regarded as the moment that it begins to "unconceal" itself to our "mind's eye" in an ever more intense illumination. But as Ptolemy says, this does not yet fully meet the criterion for "appearing," because, since the star is under the Sun's rays for a number of days, this configuration is still indefinite. It is only when the star is exactly conjunct with the Sun that this configuration is definite. This is the moment of truth—the moment of full and definite unconcealment[1]. After this moment, as the star approaches its moment of physical manifestation again, and the ultimate source of illumination is leaving it farther and farther behind, it is going into a higher kind of concealment and untruth.

We should mention here that the word *'phasis'* can also mean a 'saying,' deriving from the standard Greek verb *'phēmi'*, meaning 'to say.' We might think that this is just an accidental homonym, but we should not take it for granted that the two different verbs were not thereby related in the inquiring Greek mind[2]. It is important to repeat that for the Platonists the higher realm of the invisible and supersensible is only accessible through speech. Compare the verb *'epitellō'* treated in the next note.

epitellō — arise. This word also has two basic meanings, and they are nearly the same as for the word *'phasis'* discussed above. The word commonly means 'to enjoin' or 'to command,' but in astronomical contexts it means 'to arise.' In Book VIII of the *Almagest* Ptolemy reserves it for the arising of a celestial body from the rays of the Sun, and does not use it for the rising of the body above the horizon. For this latter the word *'anatellō'* is used, although in the phenomenon of morning rising the two are connected. We have used the word 'arise' to translate *'epitellō'* rather than the word 'rise,' because it has more the

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[1] This is a philosophical ground for a distinction between cazimi and combust.

[2] *Cf.* Heidegger, *Early Greek Thinking*, 3rd Essay, "Moira", sections 3 and 7.

sense of coming to be.

As yet, we have no idea as to how the two meanings of this word may be related, if at all. But is seems significant that *'epitellō'*, the principal word for heliacal rising, and the more general word *'phasis'*, whose most paradigmatic instance is also heliacal rising, both have one meaning corresponding to speaking, and another corresponding to manifestation.. Let me only say here that Aristotle defines speech as "revelatory sound[1]."

episēmasia — indications. This is a troublesome noun. The verb *'episēmainō'* from which it is derived basically means 'to set a mark upon something,' or 'to give signs or symptoms of something.'

In the introductory remarks to the *Phases*, Ptolemy clearly uses it to refer to the weather expected on a certain day (rain, wind, etc.), as recorded by the various observers in the calendar. But in the second book of the *Tetrabiblos*, Ptolemy uses the term for the lunar halos and other atmospheric signs of upcoming weather. In other words, he uses it to refer both to the weather itself and to indications of the weather. To make matters even more complicated, Ptolemy sometimes uses the word alone (or its verbal equivalent *'episēmainei'*, 'it is indicative') *as* one of the expected weather entries; thus he may write: "For Eudoxus, rain, a south wind, indications."

The second of these usages is perhaps the most direct and regular, but the first and third usages need to be constructed.

As for the first, the weather itself may perhaps be regarded as the mark set upon the atmosphere by the heliacal risings or settings themselves. Or alternatively, the weather of earlier years may be here regarded as a sign or indication of like weather to come at the times of the same heliacal risings and settings. In this uncertainty, we have simply used the English translation 'indications.'

As for the third, it is quite mysterious. It is evidently traditional usage, because it also occurs in the Geminus calendar. Once in the Ptolemy calendar and once in the Geminus calendar some specific weather conditions are explicitly indicated[2] with this word, but all the rest of the time it only says "indications," or "it is indicative."

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[1] *On Interpretation*, sections 1-6.

[2] Ptolemy 26 Mesore, Geminus Sagittarius, 16th day.

A few scholars have argued (evidently from context) that in the calendar itself the word refers to changes in the existing weather, as if to say "it is ominous." But this is literally to say that omens are present. So perhaps it really means that at this time there are weather indicators (in the second sense discussed above) to be found in the atmosphere. This is our present preferred interpretation, but it will clearly require further confirmation. For now we have also translated it here as "indications."

The Phases of the Fixed Stars and a Collection of Indications

by Ptolemy

Prologue

Section 1. How many differentia[1], then, are assembled for the phases of the fixed stars, and what are the additional causes[2]?

As for the kinds of observations that we must lay down for the demonstrations of the particular stars, and the theorems that must be methodically employed for the rest of them—that is, with what degree of the circle through the middle of the zodiac each of the stars in question co-culminates and in all respects co-rises and co-sets for each of the inhabited regions[3]; and again, how much circumference under the earth it is necessary for the Sun to be distant for the phases [to occur] (both along the greatest circle being described and along the ecliptic circle), and how many degrees each of the stars must be distant from the Sun (degrees from which the individual times are put together)[4]—as for all these matters, we covered them at greater length in a special treatise[5] of this work, setting out ahead of time, according to each zone, all the aforementioned quantities for the different fixed

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[1] The *O.E.D.* gives the following definition: "*Logic.* The attribute by which a species is distinguished from all other species of the same genus; a distinguishing mark." The reader might think of the word as being roughly synonymous with 'category' as long as 'category' is used in a non-rigorous sense. This is an English word derived from Latin and we use it because Ptolemy clearly uses the Greek equivalent, '*diaphorai*', rigorously in the philosophical sense. [RH]

[2] *para tinas aitias.* This phrase might also mean something like 'by what causes.' However, compare section 8.

[3] *Cf.* Book VIII, Chap. 5, *Almagest.*

[4] *Cf.* Book VIII, Chap. 6, *Almagest.*

[5] *syntaxis.*

stars of the first and second magnitude that make risings and settings in the 5 zones established[1] by us right around the middle of our inhabited world, zones which differ from one another by one-half hour[2].

For the first of these we take, as from the south, the circle being drawn through Syene and Berenike and in general through all those places in which the greatest day is of 13½ hours[3]. For the second, the circle being drawn through Ailiou[4], a little south of Alexandria and Cyrene, and through all those places in which the greatest day is of 14 standard[5] hours. For the third zone, the circle being drawn through Rhodes and in general through all those places in which the greatest of the days is of 14½ standard hours. For the fourth zone, the circle being drawn through Mid-Hellespont and generally all those places in which greatest of the days is of 15 standard hours. And for the fifth zone, the circle being drawn through Aquileia[6] and Vienne and generally all those places in which the greatest of the days is of 15½ hours.

Here we shall set out for convenience the times of the phases, taken so as to be of the most use. For these times, it is also necessary to work out in advance the calculations for all of these phases. Along with them

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[1] In the *Almagest* Ptolemy takes his *klimata* at intervals of 15 minutes of the longest daylight. rather than ½ hour. There he also goes all the way from the equator to the Arctic circle. See Appendix III. [RH]

[2] Another grammatically permissible way of connecting these two opening paragraphs (and perhaps an even more natural one) would have the material of the first paragraph also covered in the "special treatise." Then, however, we would have to suppose that the sections of the *Phases* as it stands are all scrambled up.

[3] See Appendix III. [RH]

[4] We have not been able to locate this place name with certainty, but it could be el-Alemein which is at the right latitude and could be derived from an Arabic corruption of the name given here.

[5] That is, equinoctial hours.

[6] There is some question about this in Neugebauer because Aquileia is bit north of 45° but well under 46°. See Otto Neugebauer, *A History of Ancient Mathematical Astronomy*, Springer Verlag: New York, p. 929. [RH]

we shall set out the indications for the phases observed by those before us, though only for the more notably bright of the stars. But first we shall go through a few matters concerning the phases themselves and the usefulness of the individual observations.

Section 2. We call the phase[1] of a fixed star the figuration being taken in relation to the Sun and the horizon for the first or last of its appearances[2], by which it also obtains such a name. Of the figurations proposed in this way, four more generic differentia are assembled. For, just that many positions of the Sun and the star, and the two semicircles of the horizon (for risings and for settings respectively), interchange with one another.

And the position of the stars according to each of the semicircles is more commonly designated by "rising" and "setting," while the position of the Sun, in accordance with the peculiarity of the times being shown by it, is designated by "morning" or "evening." For this reason, whenever we take the star and the Sun on the semicircle where risings occur, we commonly call such a figuration "morning rising;" and again, whenever we take both on the semicircle where settings occur, we call this configuration "evening setting." But alternating these terms, whenever we conceive the star to be on the semicircle where risings occur and the Sun on that where settings occur, we call such a figuration "evening rising;" and whenever, conversely, we conceive the Sun to be on the semicircle where risings occur and the star on that where settings occur, we likewise call this figuration "morning setting."

Section 3. Again, for each of the four figurations set out there arise two primary differentia: we call some of these figurations true[3], others

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[1] *phasis.* See **General Note** to **Translator's Preface.**

[2] *phainomenon.* Also from the verb *phainō* (to appear), and related as a participle to the abstract noun *phasis.*

[3] See **General Note** under *phasis* for an explanation of how true phases might qualify as phases, even though the star is not visible at that time.

apparent[1]. And broadly speaking, the true ones occur whenever not only the star but the Sun too is exactly on the horizon, while the apparent ones occur whenever the star is right on the horizon, but the Sun is under the earth, not simply, but either before its rising or after its setting.

More specifically for each of the figurations, they call a true rising a morning rising, whenever the Sun and the star both rise together, and a true rising an evening one, whenever the star rises at the same time the Sun sets; they call a true setting a morning setting, whenever the star sets at the same time the Sun rises, and a true setting an evening one, whenever the star and the Sun both set together.

Again, they call an apparent rising a morning rising, whenever the rising star appears before the rising of the Sun, and an apparent rising an evening one, whenever the rising star appears after the setting of the Sun; they call an apparent setting a morning setting, whenever the setting star appears before the rising of the Sun, and an apparent setting an evening setting, whenever the setting star appears after the setting of the Sun.

Section 4. For the true figurations, then, it happens that the places of the stars are not beheld separately, but the places of the Sun are indeed beheld, since this figuration is constructed exactly on the horizon. For the apparent figurations—as much as we simply learn by hearing them[2] thus—, the places of the Sun are never yet beheld. For according to the different separations of the Sun under the earth, it is possible that the morning and evening risings and settings of the stars are apparent for several days, since the underlying times admit a certain variation. For this reason, one must not yet call either of the figurations already discussed phases. For appearing[3] is the manifestation of a figuration at once definite[4] and apparent[5], and of the figurations set out, the true

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[1] *phainomenos.*

[2] This is a literal translation of the Greek. It seems to mean that "hearing" the word conveys the sense of the Sun being invisible.

[3] *phasis.* Emphasizing here the verbal character of this abstract noun.

[4] *horismenon.* Literally, "horizoned."

ones make the times themselves unclear, while the apparent ones make the places of the Sun unclear.

Whenever, then, we in no way simply take up the apparent figurations thus heedlessly and at random, but by specifying the first or last of the risings and settings, then they—[the time] of the star that has already arisen and the place of the Sun—contain the property of phasing, in accordance with which—depending on whether it is first or last—the stars are able to appear as rising or setting[1].

And they are assembled in accordance with the delimitation for the parallels set out, and in general, for as many as have the horizon cutting the tropics, morning rising phase is the first of the apparent risings of the star, while evening rising phase is the last of its apparent risings. And again, morning setting phase is the first of the apparent settings of the star, while evening setting phase is the last of the apparent settings of the star.

Section 5. For the fixed stars having their positions right on the circle through the middle of the zodiac, then, the order of the phases holds to the order of exposition. During the time from the morning rising until the evening rising, stars appear when rising and not when setting. During the time between the evening rising and the morning setting they do appear, but not when rising or setting. During the whole time from evening setting until morning rising they do not appear. And these periods when they disappear for a time, we call the times of "arising and lying hidden;" we call the morning rising of the stars themselves simply "arising,[2]" and their evening setting simply "concealment[3]." And those periods when the stars appear for a certain time without rising or setting, they call times of "curtailed passage."

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[5] *phainomenon.*

[1] It seems to be left as an unanswered question here whether, and under what circumstances, the true configuration could be considered to be truly a "phasing." See **General Note** under *phasis.*

[2] *epitolē.* See **General Note** in **Translator's Preface.**

[3] *krupsis.* See **General Note** in **Translator's Preface.**

Section 6. For the stars sufficiently distant from the circle through the middle of the zodiac toward the north or south, the order of the phases sometimes changes from the order set out with respect to one of the conjunctions, and one of the said properties is observed with the order, the opposite changes by itself along with the order. For those stars keeping a position more southerly than the circle through the middle of the zodiac, the evening setting is observed to precede in time the morning rising, and the property of arising and concealing [passages] happens to them, because for the complete time between these two phases they disappear. Conversely, the morning setting sometimes precedes in time the evening rising, but not yet so that the property of curtailed passages happens to them too, but rather the property of the so-called nocturnal passages, since during the time from the morning setting until the evening rising both rising and setting stars and those passing through the whole hemisphere above the earth appear to be rising with the setting of the Sun, but setting before its rising.

Conversely, for those stars keeping a position more northerly than the circle through the middle of the zodiac, the evening rising is observed to precede in time the morning setting, and the property of curtailed passage to attend them, because, again, during the time between these two phases they appear to neither rise nor set. But the morning rising often precedes in time the evening setting without yet having the property of invisible stars of both arising and lying hidden attend them, but rather the property of the so-called apparent passage, since during the time from morning rising until evening setting they can appear to be setting with the setting of the Sun, but rising before its rising. Such stars are also called "visible all around."

Therefore, with regard to those of the invisible phases said to arise and lie hidden, one must also observe carefully in the description what it happens to be, whether the rising in morning simply or the setting at night of those of apparent passages or all around visibility, similarly for those of curtailed passages having the evening rising preceding in time the morning setting, or conversely those of nocturnal passages having the morning setting preceding the morning rising.

Section 7. Such remarks, then, concerning the differentia and the orders of the phases would closely suit our present purpose. And we have

made use of the method of reckoning by our year[1], because, since the annual surplus is restored with the intercalated days every four years, it for the most part permits the same phases to be taken for days with the same name for a long time. Setting out, then, each of the days in their proper order from the first of Thoth, we write under them, as much as possible, what is brought about along with these same phases in accordance with a certain number of hours for the zones we have established. We designate the zone in which each phase occurs by prefixing the number of total standard hours of the greatest day or night. And we subjoin the indications that the ancients observed for the surrounding atmosphere[2] in the transits of the Sun in accordance with the days set out[3], not however that these will result invariably and from each phase, but as for the most part, and in so far as none of the other causes, which are many, resists it.

For one must believe that the condition of the atmosphere is somehow turned[4] by the figurations we have laid out for the fixed stars in relation to the Sun, just as it is by the course of the Sun alone from the solstices to the equinoxes. But truly one must believe that the whole cause of the symptom does not lie with these, but the Moon and the 5 planets contribute most to the fulfillment of what is to come. The Moon contributes for the most part by adjusting the daily indication for the phases themselves against those of its own figurations in relation to the Sun. The 5 planets contribute by again working together with the qualities of the prognostications analogously to the combinations and commensurabilities of their proper natures. In just this way, one must

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[1] The Alexandrian year.

[2] *periechōn.*

[3] *Cf.* Geminus' Calendar, which is included at the end of the *Phases* in this volume, in which the entries are organized in accordance with the solar transits of each zodiacal sign. Ptolemy's entries will be in accordance with each day of the Alexandrian calendar instead.

[4] *trepō.* This is the literal meaning of this word. It also means change in the most general sense. But we believe a careful reading of the first book of the *Tetrabiblos* would indicate that what Ptolemy has in mind is an actual physical turning.

see the punctuality or tardiness of the annual seasons themselves as resulting from the separations of the conjunctions of Sun and Moon, and their qualities as being intensified[1] to the greatest extent in accordance with the more and less on account of the planets transiting them.

Section 8. It is well, then, that there be added to the investigation of the indications and of such predictions as a whole, first conjectures about any causes besides these indicators since we deem that the whole cause is not in this alone, and when we consider that of those men who have recorded the indications, different ones happen to have made their observations in different regions and in many senses have not encountered similar conditions, either through a peculiarity of the region, or because the same phases are not everywhere united on the same days.

And then it is well that there be added conjectures about how much this cause allows of participation by other causes as well, indeed by additionally keeping an eye on the course of the planets as set out in calendars, so that, on the one hand, we match the days of the indications to the days of the nearest quarter (especially with those before conjunction and full Moon), and furthermore to the days when the Sun's sign changes around the time of these same phases; and on the other hand, we match the qualities to the nature of any body being configured with them, especially to those of the five planets, with the star of Aphrodite working together for the hot[2] areas of the weather, that of Kronos for the cold areas, that of Zeus for the wet, that of Ares for the dry, and that of Hermes for the kinetic and windy areas, the conflict of qualities being understood in relation to the opposites of the unions.

Section 9. As for our not inserting some of the fainter of the stars named by the ancients either in the syntaxis of this treatment itself, or now, (such as Sagitta, Pleiades, Haedi, Vindemiatrix, Dolphin, or whatever[3]),—one must concede, if the question is not weighty, that

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[1] *diateinō.* Literally, stretched.

[2] Here as in the *Tetrabiblos*, Venus is considered to be warm not cold. This is in contrast to the teachings of later astrologers, such as Lilly, who hold that Venus is cold. [RH]

[3] These stars and constellations are frequently cited in Geminus' Calendar.

especially the last and first phases of such small stars are altogether phantasms because they are hard to distinguish and hard to consider anyway—someone might consider that those before us used them more from a certain guesswork than careful observation made from the appearances themselves.

Then, it is quite clear that, since this first publication is submitted by us only as far as fixed stars of the first and second magnitude for the reasons set out, even the adding of magnitudes for such alone of the lower ones and not all carries a responsibility hard for me to discharge, since the indications registered for them stand under the accusation of being uncertain owing to the inconstancy of the days. And anyway, the more suitable of the additional ones would be anticipated along with the phases of the brighter stars about the same time, for example, the more suitable of those for Sagitta and Dolphin with the phases of the bright star in Aquila, of those for Vindemiatrix with Arcturus and Spica, for Pleiades and Haedi with Capella and the Hyades.

The magnitude of each of these brighter stars would more reliably be able give a certain turn[1] to the surroundings, and the time of the phase would be clear and with a determinate perception, which would not seem to be true for the fainter stars—at least for those being rejected as not figuring into any myths—even if a certain cluster should happen to be assembled from several. Rather, one should not properly dignify the first or last of the phantasms which fade out in the morning and evening with the name morning or evening phase when the separation of the Sun under the horizon is greater than that constructed for those [brighter stars]. But when these fainter stars have been sufficiently argued for, we will even before that time enter them in the register, which is as follows:

[1] *tropos*. See page 7, note 4 in section 7.

The Calendar or Register

Month of Thōth

Day 1. 14½ hours[1]: The star upon the tail of Leo arises. For Hipparchus, the Etesian winds cease. For Eudoxus, rainy weather, thunder, the winds cease.

Day 2. 14 hours: The star upon the tail of Leo arises, and Spica goes into hiding. For Hipparchus, it is indicative.

Day 3. 13½ hours: The star upon the tail of Leo arises. 15 hours: The star called Capella rises in the evening. For the Egyptians, the Etesian winds cease. For Eudoxus, the winds change. For Caesar[2], wind, rain, thunder. For Hipparchus, the east wind blows.

Day 4. 15 hours: The last star of Eridanus sets in the morning. For Callippus, there is stormy weather and the Etesian winds cease.

Day 5. 13½ hours: Spica goes into hiding. 15½ hours: The bright star of Lyra sets in the morning. For Metrodorus, bad air. For Conon, the winds abate.

Day 6. 15½ hours: The bright star of southern claw of the Claws of Scorpio goes into hiding. For the Egyptians, fog and burning heat or rain or thunder. For Eudoxus, wind, thunder, bad air. For Hipparchus, wind, damp weather.

Day 7. For Metrodorus, bad air. For Callippus, Euctemon, Philippus, bad air and irregularity of the air. For Eudoxus, rain, thunder, changing wind.

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[1] This is a *klima* or latitude reference. [RH]

[2] The "Caesar" referred to here is Julius Caesar who, with the assistance of the Egyptian astrologer Sosigenes, reformed the calendar into the form in which we now know it, with a small change by Augustus Caesar later on and more considerable reforms by the Church in the Sixteenth Century. [RH]

Day 8. For the Egyptians, rainy weather, stormy weather at sea or south wind. For Caesar, changing winds, rainy weather, and the Etesian winds cease.

Day 9. 14 hours: The bright star of Cygnus sets in the morning. For the Egyptians, the due west wind or the northwest wind blows.

Day 10. 13½ hours: The bright star of Perseus rises in the evening. For Philippus, bad air. For Dositheus, there is stormy weather.

Day 11. For the Egyptians, it is indicative.

Day 12. 15 hours: The bright star of the southern claw of the Claws of Scorpio goes into hiding.

Day 13. For Dositheus, ill-mixture of airs.

Day 14. 14½ hours: The star called Canopus arises. For Caesar, the north winds cease.

Day 15. For Eudoxus, south winds.

Day 16. For Callippus and Conon, it is indicative.

Day 17. 14½ hours: The bright star of Cygnus sets in the morning, and the bright star in the southern claw of the Claws of Scorpio goes into hiding, and the last star of Eridanus sets in the morning. For Eudoxus, the north winds cease. For Metrodorus, it is indicative. For Democritus the Abderite, it is indicative, the swallow disappears.

Day 18. 15½ hours. The star down upon the knee of Sagittarius goes into hiding. For the Egyptians, rainy weather, it is indicative, the beginning of the waning of summer, the swallow disappears. For Dositheus, damp weather. For Euctemon, the beginning of fall.

Day 19. 15½ hours: The bright star of the southern fish of Pisces rises in the evening. For Hipparchus, bad air and rainy weather at sea, and the beginning of the waning of summer.

Day 20. For Caesar, the beginning of fall, and the swallow disappears. For Metrodorus, rainy weather at sea and bad air.

Day 21. 14 hours: The bright star of the southern claw of the Claws of Scorpio goes into hiding. 15 hours: The star in the following shoulder of Auriga rises in the evening. For the Egyptians, the due west wind or southwest wind, the east wind late in the day. For Eudoxus, fall is moderate.

Day 22. 14½ hours: The star called Antares goes into hiding. For the Egyptians, the due west wind or northwest wind and drizzle. For Eudoxus, damp weather.

Day 23. 14½ hours: The star called Capella rises in the evening. 15½ hours: Arcturus rises in the morning. For the Egyptians, drizzle and wind, it is indicative. For Callippus and Metrodorus, rainy weather.

Day 24. 13½ hours: The star common to Pegasus and Andromeda sets in the morning.

Day 25. 13½ hours: The bright star of the southern claw of the Claws of Scorpio goes into hiding. 15 hours: The bright star of Cygnus sets in the morning. For the Egyptians, the west wind or south wind, and a thunder-storm through the day.

Day 26. 15 hours: Arcturus rises in the morning. For Eudoxus, rain. For Hipparchus, the west wind or the south wind.

Day 27. 14 hours: The star common to Perseus and Andromeda sets in the morning, and the last star of Eridanus sets in the morning.

Day 28. The fall equinox. For the Egyptians and Eudoxus, it is indicative.

Day 29. 14 hours: The star called Antares goes into hiding. 14½ hours: Arcturus rises in the morning. For Euctemon, it is indicative. For Democritus, rain and irregularity of winds.

Day 30. 14½ hours: The star common to Perseus and Andromeda sets

in the morning. For Euctemon and Philippus and Conon, it is indicative.

Month of Phaōphi

Day 1. For the Egyptians, the west wind or the south wind. For Hipparchus, it is indicative.

Day 2. 15 hours: The star common to Perseus and Andromeda sets in the morning. 15½ hours: The bright star of the northern claw of the Claws of Scorpio goes into hiding. For Eudoxus and Euctemon, it is indicative. For Hipparchus, the south or west wind.

Day 3. 14 hours: Arcturus rises in the morning. 15½ hours: The bright star of Cygnus sets in the morning.

Day 4. 15 hours: The bright star of the northern claw of the Claws of Scorpio goes into hiding. For the Egyptians and Callippus, it is stormy weather, bad air. For Euctemon and Philippus, rain.

Day 5. 15½ hours: The star common to Perseus and Andromeda sets in the morning. For Eudoxus, rain. For Euctemon, there is stormy weather. For Metrodorus, rain.

Day 6. 13½ hours: Arcturus rises in the morning, and the last star of Eridanus sets in the morning. 14½ hours: The bright star of the northern claw of the Claws of Scorpio goes into hiding, and the star called Antares goes into hiding. 15½ hours: The bright star of the northern Corona rises in the morning. For the Egyptians and Caesar, stormy weather, rain, thunder, lightning.

Day 7. 13½ hours: Spica arises. 14 hours: The star called Capella rises in the evening, and the bright star of the northern claw of the Claws of Scorpio goes into hiding. For the Egyptians, rainy weather, it is stormy weather. For Eudoxus, rain and changing wind. For Dositheus, it is indicative.

Day 8. 13½ hours: The bright star of the northern claw of the Claws of Scorpio goes into hiding. 14½ hours: The star in the following shoulder

of Auriga rises in the evening, and Spica arises. For Democritus, it is stormy weather, the season for sowing.

Day 9. 15½ hours: Spica arises. For the Egyptians, the north wind blows.

Day 10. 15 hours: The bright star of the northern Corona rises in the morning. For Hipparchus, south wind.

Day 11. 15 hours: The star down upon the knee of Sagittarius goes into hiding.

Day 12. 15 hours: The star called Antares goes into hiding. For the Egyptians, the due west wind or the southwest wind. For Eudoxus, it is indicative. For Hipparchus, the east wind.

Day 13. [no entry]

Day 14. For Dositheus and Eudoxus, it is indicative.

Day 15. For the Egyptians, the northwest wind, rain.

Day 16. 14½ hours: The bright star of the northern Corona rises in the morning. For Eudoxus, north or south winds. For Dositheus, changing winds. For Callippus, it is indicative. For Caesar, irregular winds, rain, thunder.

Day 17. 13½ hours: The star called Antares goes into hiding. For the Egyptians, the north wind or the southwest wind. For Eudoxus, it is indicative.

Day 18. 13½ hours: Arcturus sets in the evening.

Day 19. For Eudoxus, variable winds, thunder.

Day 20. 14 hours: The star in the following shoulder of Auriga rises in the evening. For Hipparchus, the south or the north wind.

Day 21. 13½ hours: The star called Capella rises in the evening.

Day 22. 14 hours: The bright star of the northern Corona rises in the morning. For the Egyptians, the west wind or the south wind throughout the day, rain. For Dositheus, indications.

Day 23. [no entry]

Day 24. 14½ hours: The star called Canopus sets in the morning.

Day 25. For the Egyptians, irregular winds.

Day 26. 14 hours: Arcturus sets in the evening. For Eudoxus, it is indicative. For Caesar, the wind blows.

Day 27. 13½ hours: The bright star of the northern Corona rises in the morning. 14½ hours: The star down upon the knee of Sagittarius goes into hiding. For the Egyptians and Callippus, it is indicative. For Euctemon and Callippus, purity of air, much stormy weather at sea.

Day 28. 13½ hours: The star in the following shoulder of Auriga rises in the evening. For Metrodorus, it signifies. For Euctemon and Callippus, a mixing of the air, and stormy weather at sea.

Day 29. [lacking in the text]

Day 30. For the Egyptians, it is very stormy.

Month of Athyr

Day 1. 13½ hours: The bright star of the southern claw of the Claws of Scorpio arises.

Day 2. 14½ hours: The bright star of the southern claw of the Claws of Scorpio arises. 15 hours: The same. For the Egyptians, it is indicative. For Dositheus, it is stormy weather. For Democritus, cold weather or frost. For Hipparchus, constant south wind.

Day 3. 13½ hours: The bright star of the northern claw of the Claws of Scorpio arises. 15½ hours: The bright star of Lyra rises in the morning.

For Euctemon and Philippus, a strong wind blows.

Day 4. 14 hours: The bright star of the northern claw of the Claws of Scorpio arises. 14½ hours: Arcturus sets in the evening. For the Egyptians, a due south or south-west wind. For Callippus and Euctemon, excessive winds. For Caesar and Metrodorus, winds, it is stormy.

Day 5. 14½ hours. The bright star of the northern claw of the Claws of Scorpio arises.

Day 6. 14 hours: the star down upon the knee of Sagittarius goes into hiding. For Conon and Eudoxus, an ill-mixture of winds. For Callippus, an ill-mixture of air. For Caesar and Hipparchus, a south wind or a cold north wind.

Day 7. 14 hours: The bright star of the Hyades rises in the evening. For the Egyptians, a boisterous south wind. For Meton, a west wind. For Eudoxus, a north or south wind. For Metrodorus, an ill-mixture of air. For Euctemon and Philippus and Hipparchus, rain.

Day 8. 13½ hours: The bright star of the Hyades rises in the evening. For Callippus, rainy weather. For Euctemon, it is indicative.

Day 9. 15½ hours: The star common to Eridanus and the foot of Orion sets in the morning. For the Egyptians, stormy weather, rain.

Day 10. 14 hours: The star called Canopus sets in the morning. For the Egyptians, a south or west wind. For Dositheus, stormy weather.

Day 11. 15 hours: The bright star of Lyra rises in the morning. For Meton, stormy rain. For Hipparchus, a cold northwest wind.

Day 12. 15 hours: Arcturus sets in the evening, and the star common to Eridanus and the foot of Orion sets in the morning.

Day 13. 13½ hours: The star down upon the knee of Sagittarius goes into hiding. For the Egyptians, a due south wind or a southeast wind through the day, it drizzles. For Metrodorus, it is stormy, stormy. For Euctemon, rainy weather, it is stormy.

Day 14. 14½ hours: The star common to Eridanus and the foot of Orion sets in the morning. For Philippus and Euctemon, stormy weather, squalls. For Hipparchus, a north wind or a cold and wet south wind.

Day 15. 13½ hours: The bright star of Perseus sets in the morning, and the bright star of the northern Corona sets in the evening. 15½ hours: The bright star of the Hyades sets in the morning. For the Egyptians and Hipparchus, the beginning of winter. For Metrodorus and Callippus and Conon, indications.

Day 16. 13½ hours: The bright star of the Hyades sets in the morning. 14½ hours: The same. 15 hours: The same. For Euctemon and Dositheus, it is stormy.

Day 17. 14 hours: The star common to Eridanus and the foot of Orion sets in the morning. 15½ hours: The star upon the head of the preceding twin of Gemini rises in the evening. For Eudoxus, the beginning of winter and indications. For Democritus, stormy weather both on land and at sea.

Day 18. [omitted in text]

Day 19. 14½ hours: The bright star of Lyra rises in the morning. For the Egyptians, a south or southeast wind through the day. For Caesar, it is stormy.

Day 20. 13½ hours: The star common to Eridanus and the foot of Orion sets in the morning. 14 hours: The bright star of Perseus sets in the morning. 15½: The star in the preceding shoulder of Orion sets in the morning, and the middle star of the belt of Orion sets in the morning. For Caesar, it is stormy.

Day 21. 15 hours: the star in the preceding shoulder of Orion sets in the morning, and the middle star of the belt of Orion sets in the morning. 15½ hours: Arcturus sets in the evening. For the Egyptians, a north wind through the day and night. For Eudoxus, rain. For Caesar, stormy weather.

Day 22. 14½ hours: The star in the preceding shoulder of Orion sets in

the morning.

Day 23. 13½ hours: The star called Canopus sets in the morning. 14 hours: The bright star of the northern Corona sets in the evening, and the star in the preceding shoulder of Orion sets in the morning. 15 hours: The star upon the head of the preceding twin of Gemini rises in the evening. For Eudoxus, wintry conditions. For Eudoxus, a cold north wind.

Day 24. 13½ hours: The star in the right fore frog of the hoof of Centaurus arises. 14½ hours: The middle star of the belt of Orion sets in the morning. 15½ hours: Sirius sets in the morning. For the Egyptians, wintry conditions. For Eudoxus, a cold north wind.

Day 25. 13½ hours: The star in the preceding should of Orion sets in the morning, and the star called Antares arises. 14½ hours: The bright star of Perseus sets in the morning. For Euctemon and Dositheus, stormy weather and rainy weather. For Caesar, an ill-mixture of air.

Day 26. 13½ hours: The star in the preceding shoulder of Orion rises in the evening, and the last star of Eridanus rises in the evening. 14 hours: The bright star of Lyra rises in the morning, and the middle star of the belt of Orion sets in the morning, and the star called Antares arises. For Eudoxus, severe stormy weather.

Day 27. 14½ hours: the star called Antares arises. 15 hours: Sirius sets in the morning. 15½ hours: The bright star of Cygnus rises in the morning, and the star in the following shoulder of Orion sets in the morning. For the Egyptians and Hipparchus, constant cold. For Eudoxus and Conon, the air is wintry. For Callippus, rainy weather.

Day 28. 14 hours: The star in the preceding shoulder of Orion rises in the evening. 14½ hours: The star upon the head of the preceding twin of Gemini rises in the evening. 15 hours: The star in the following shoulder of Orion sets in the morning, and the star called Antares arises. For the Egyptians, drizzle.

Day 29. 13½ hours: The middle star of the belt of Orion sets in the morning. 15½ hours: The star called Antares arises.

Day 30. 13½ hours: The middle star of the belt of Orion rises in the evening. 14½ hours: The star in the following shoulder of Orion sets in the morning, and the star in the preceding shoulder of Orion rises in the evening. 15½ hours: The star upon the head of the following twin of Gemini rises in the evening.

Month of Choiak

Day 1. 14½ hours: Sirius sets in the morning. 15 hours: The bright star of Perseus sets in the morning. For the Egyptians, a south wind and rain. For Eudoxus, an ill-mixture of air. For Dositheus, indications. For Democritus, uncertain sky and sea for the most part.

Day 2. 13½ hours: The star in the following shoulder of Orion rises in the evening, and the star common to Eridanus and the foot of Orion rises in the evening. 14 hours: The star upon the head of the preceding twin of Gemini rises in the evening, and the star in the following shoulder of Orion sets in the morning. 14½ hours: The bright star of the northern portion of Corona sets in the evening.

Day 3. 13½ hours: The star in the following shoulder of Orion sets in the morning. 15 hours: The star in the preceding shoulder of Orion rises in the evening.

Day 4. 13½ hours: The bright star of Lyra rises in the morning. 14 hours: The star in the following shoulder of Orion rises in the evening, and the middle star in the belt of Orion rises in the evening. 15 hours: The star upon the head of the following twin of Gemini rises in the evening. For the Egyptians, a due west wind or a south wind through the day, it rains. For Conon, it is stormy.

Day 5. 13½ hours: The star called Capella sets in the morning, and the star upon the head of the preceding twin of Gemini rises in the evening. 14 hours: Sirius sets in the morning. 15½ hours: The star in the preceding shoulder of Orion rises in the evening. For Caesar and Euctemon and Eudoxus and Callippus, stormy weather.

Day 6. 14 hours: The star in the right fore frog of the hoof of Centaurus

arises. 14½ hours: The star in the following shoulder of Orion rises in the evening. For Metrodorus, wintry conditions. For Euctemon and Philippus and Callippus, an ill-mixture of winds.

Day 7. 14 hours: The star common to Eridanus and the foot of Orion rises in the evening. 14½ hours: The star upon the head of the following twin of Gemini rises in the evening, and the middle star of the belt of Orion rises in the evening. 15 hours: The bright star of Cygnus rises in the morning. For the Egyptians, it drizzles. For Caesar and Conon, it is stormy.

Day 8. 15 hours: The star in the following shoulder of Orion rises in the evening. 15½ hours: The bright star of Perseus sets in the morning. For the Egyptians, it drizzles. For Caesar and Euctemon and Eudoxus, stormy weather.

Day 9. 13½ hours: Sirius sets in the morning. 14 hours: The star called Capella sets in the morning, and the star upon the head of the following twin of Gemini rises in the evening, and the last star of Eridanus rises in the evening. For the Egyptians and Dositheus and Democritus, stormy weather.

Day 10. 15 hours: The bright star of the northern Corona sets in the evening, and the middle star of the belt of Orion rises in the evening. For the Egyptians, a southwest or south wind. For Eudoxus and Dositheus, stormy air.

Day 11. 13½ hours: The star upon the head of the following twin of Gemini rises in the evening. For Hipparchus, a strong north wind. For Eudoxus, rain.

Day 12. 14½ hours: The star common to Eridanus and the foot of Orion rises in the evening. For Caesar, rainy weather. For Euctemon and Eudoxus and Callippus, stormy air and rainy weather.

Day 13. 13½ hours: The star in the following shoulder of Auriga sets in the morning. 15½ hours: The middle star of the belt of Orion rises in the evening. For Caesar, rainy weather. For Euctemon and Eudoxus and Callippus, wintry air and rainy weather.

Day 14. 14½ hours: The star called Capella sets in the morning. For Metrodorus and Euctemon and Callippus, wintry conditions. For Democritus, thunder, lightning, water, wind.

Day 15. For the Egyptians, a cold northwest wind or a south wind and thunderstorm. For Callippus, a south wind and indications. For Eudoxus, wintry air.

Day 16. 14½ hours: The bright star of Cygnus rises in the morning. 15 hours: The star common to Eridanus and the foot of Orion rises in the evening. For the Egyptians, it is stormy.

Day 17. For Hipparchus, a strong south wind or a north wind.

Day 18. 14 hours: The star in the following shoulder of Auriga sets in the morning. For the Egyptians, rainy weather with winds. For Eudoxus, it is stormy.

Day 19. 15 hours: The star called Capella sets in the morning. 15½ hours: The bright star of the northern Corona sets in the evening. For the Egyptians, a cold north wind or a south wind and rainy weather.

Day 20. 15½ hours: Procyon sets in the morning. For Caesar, it is stormy.

Day 21. 15½ hours: The star common to Eridanus and the foot of Orion rises in the evening.

Day 22. 15 hours: Procyon sets in the morning. For Hipparchus, a south wind.

Day 23. 14½ hours: The star in the following shoulder of Auriga sets in the morning, and the star in the right fore frog of the hoof of Centaurus arises. 15½ hours: The bright star of Aquila rises in the morning. For the Egyptians and Eudoxus and Dositheus, a southwest or a due south wind.

Day 24. 14½ hours: Procyon sets in the morning, and the last star of Eridanus rises in the evening. For Eudoxus, wintry air.

Day 25. 13½ hours: Procyon rises in the evening. 14 hours: Procyon sets in the morning. 15 hours: The bright star of Aquila rises in the morning. For the Egyptians, indications.

Day 26. Winter solstice. 13½ hours: Procyon sets in the morning and Sirius rises in the evening. 15½ hours: The star called Capella sets in the morning.

Day 27. 13½ hours: The bright star of Aquila goes into hiding. 14 hours: Procyon rises in the evening. 14½ hours: The bright star of Aquila rises in the morning.

Day 28. 15 hours: The star in the following shoulder of Auriga sets in the morning. 15½ hours: The bright star in of the southern fish of Pisces goes into hiding. For the Egyptians and Caesar, stormy weather. For Hipparchus and Meton, it is indicative, thunderstorm.

Day 29. 14½ hours: Procyon rises in the evening. For the Egyptians and Conon and Meton and Callippus, stormy weather. For Caesar and Metrodorus, indications, ill-mixtures.

Day 30. 14 hours: The bright star of Aquila rises in the morning, and the bright star of Aquila sets in the evening. For the Egyptians, a southwest wind and an ill-mixture of air. For Eudoxus and Metrodorus, stormy air. For Hipparchus, stormy evening.

Month of Tybi

Day 1. 14 hours: Sirius rises in the evening. 15 hours: Procyon rises in the evening. For Eudoxus, it is indicative. For Democritus, moderate stormy weather.

Day 2. 13½ hours: The star upon the head of the preceding twin of Gemini sets in the morning. For Dositheus, it is stormy.

Day 3. 13½ hours: The bright star of Aquila arises. 15½ hours: Procyon rises in the evening. For Euctemon and Philippus and Democritus, it is indicative.

Day 4. 13½ hours: The bright star of Cygnus rises in the morning, and the star upon the head of the following twin of Gemini sets in the morning. 14½ hours: The bright star of Aquila sets in the evening. 15 hours: The bright star of the southern fish of Pisces goes into hiding. For the Egyptians, stormy weather at sea. For Euctemon, it is indicative.

Day 5. 14 hours: The star upon the head of the preceding twin of Gemini sets in the morning. 15½ hours: The star in the following shoulder of Auriga sets in the morning.

Day 6. 13½ hours: The star down upon the knee of Sagittarius arises. 14 hours: The star upon the head of the following twin of Gemini sets in the morning. 14½ hours: Sirius rises in the evening.

Day 7. 15 hours: The bright star of Aquila sets in the evening. For Dositheus, it is indicative.

Day 8. 14½ hours: The star upon the head of the preceding twin of Gemini sets in the morning, and the star upon the head of the following twin of Gemini sets in the morning, and the bright star of the southern fish of Pisces goes into hiding. For the Egyptians, variable conditions.

Day 9. 13½ hours: The bright star of Lyra sets in the evening. 15½ hours: The bright star of Aquila sets in the evening. For the Egyptians, it is indicative. For Democritus, a south wind blows for the most part.

Day 10. 15 hours: Sirius rises in the evening.

Day 11. 15 hours: The star upon the head of the following twin of Gemini sets in the morning. For Euctemon and Philippus, moderately stormy weather.

Day 12. 14 hours: The star upon the knee of Sagittarius arises. 15 hours: The star upon the head of the preceding twin of Gemini sets in the morning. For Hipparchus and Eudoxus, it is stormy.

Day 13. 14 hours: The bright star of the southern fish of Pisces goes into hiding. 15 hours: The last star of Eridanus rises in the evening. For the Egyptians, a south wind or a west wind blows, stormy both on land

and at sea. For Metrodorus and Euctemon and Philippus and Callippus, a south wind.

Day 14. 15½ hours: The star upon the head of the following twin of Gemini sets in the morning, and the bright star of Hydra sets in the morning, and Sirius rises in the evening. For the Egyptians and Eudoxus, an excessive south wind and rain.

Day 15. 15 hours: [lacuna] For the Egyptians and Caesar, much south wind, and it is indicative at sea, thunder, drizzle.

Day 16. 15 hours: The bright star of Hydra sets in the morning. 15½ hours: The star upon the head of the preceding twin of Gemini sets in the morning. For Eudoxus and Dositheus, south wind, it is indicative. For Hipparchus, and ill-mixture of winds.

Day 17. 13½ hours: the bright star of the southern fish of Pisces goes into hiding.

Day 18. 14 hours: The bright star of Lyra sets in the evening. 14½ hours; The star down upon the knee of Sagittarius arises.

Day 19. 14½ hours: The bright star of Hydra sets in the morning. For Hipparchus, south or north wind, it is stormy.

Day 20. For the Egyptians, wintry air.

Day 21. 14 hours: The bright star of Hydra sets in the morning. 15 hours: The star upon the heart of Leo rises in the evening. For Hipparchus, a east wind blows.

Day 22. 13½ hours: The star upon the heart of Leo rises in the evening, and the bright star of Hydra rises in the evening, and the star called Canopus rises in the evening. 14 hours: The star upon the heart of Leo rises in the evening. 14½ hours: The star in the right fore frog of the hoof of Centaurus sets in the morning. 14½ [sic] hours: The star upon the heart of Leo rises in the evening. For Caesar, excessive winds.

Day 23. 13½ hours: The bright star of Hydra sets in the morning. For

Euctemon and Philippus, stormy weather. For Metrodorus, instability of the air.

Day 24. 14 hours: The bright star of Hydra rises in the evening. For the Egyptians, it rains and becomes stifling. For Caesar and Euctemon, stormy weather.

Day 25. 14½ hours: The bright star of Lyra sets in the evening, and the bright star of Hydra rises in the evening. 15 hours: The star down upon the knee of Sagittarius arises. For the Egyptians and Callippus, stormy weather, rain. For Hipparchus, the north wind blows. For Euctemon and Democritus, it pours rain.

Day 26. 15 hours: The bright star of Hydra rises in the evening. For Eudoxus, moderately stormy weather.

Day 27. For the Egyptians, a southeast or south wind, it is indicative.

Day 28. 15½ hours: The bright star of Hydra rises in the evening. For the Egyptians, rainy weather. For Hipparchus, indications.

Day 29. For Callippus and Euctemon, it pours rain. For Democritus, moderately stormy weather.

Day 30. For Hipparchus, the east wind blows.

Month of Mechir

Day 1. 15½ hours: The star down upon the knee of Sagittarius arises. For Eudoxus, rainy weather. For Metrodorus, rainy weather. For Dositheus, stormy weather.

Day 2. For the Egyptians, moderately stormy weather.

Day 3. For the Egyptians, southwest or due west wind; it is indicative.

Day 4. 13½ hours: The bright star of Cygnus sets in the evening. 15 hours: The bright star of Lyra sets in the evening. For Hipparchus, a

south or northwest wind.

Day 5. [lacking]

Day 6. 13½ hours: The star upon the heart of Leo sets in the morning. 14 hours: The star called Canopus rises in the evening. 15½ hours: The star upon the tail of Leo rises in the evening, and the star down upon the knee of Sagittarius arises. For Eudoxus, rain.

Day 7. 14 hours: The star upon the heart of Leo sets in the morning. 15 hours: The star upon the tail of Leo rises in the evening.

Day 8. 14½ hours: The star upon the heart of Leo sets in the morning, and the star upon the tail of Leo rises in the evening. For the Egyptians, a south or west wind, intermittent hail.

Day 9. 15 hours: The star upon the heart of Leo sets in the morning. For Eudoxus, fair weather, but sometimes too the west wind blows.

Day 10. 14 hours: The star upon the tail of Leo rises in the evening.

Day 11. 15½ hours: The star upon the heart of Leo sets in the morning. For the Egyptians, wintry conditions or pouring rain and an ill-mixture of winds. For Dositheus, fair weather, but sometimes the due west wind blows.

Day 12. 14 hours: The bright star of Cygnus sets in the evening. 15 hours: The last star of Eridanus goes into hiding. 15½ hours: The bright star of Perseus rises in the morning, and the bright star of Lyra sets in the evening. For the Egyptians, windy conditions. For Caesar, rainy weather. For Democritus, the west wind begins to blow.

Day 13. 13½ hours: The star upon the tail of Leo rises in the evening. For the Egyptians and Eudoxus, the beginning of spring, the due west wind begins to blow and sometimes stormy weather.

Day 14. For the Egyptians and Eudoxus, rainy weather. For Hipparchus and Callippus and Democritus, the season for the west wind to blow.

Day 15. For Caesar and Metrodorus, the beginning of spring, and the west wind begins to blow.

Day 16. [lacking]

Day 17. For the Egyptians and Eudoxus, the west winds blow. For Hipparchus, the beginning of spring. For Callippus and Metrodorus, stormy weather.

Day 18. For the Egyptians, the east wind blows. For Hipparchus, the north or due east wind blows.

Day 19. 14 hours: The star in the right fore frog of the hoof of Centaurus sets in the morning. 15½ hours: The star common to Pegasus and Andromeda rises in the morning.

Day 20. [lacking]

Day 21. 14½ hours: The bright star of Cygnus sets in the evening. For the Egyptians, the winds change. For Hipparchus, the south wind blows. For Euctemon and Philippus and Dositheus, stormy weather.

Day 22. For the Egyptians, instability of the winds and thunder-storms.

Day 23. 14½ hours: The star called Canopus rises in the evening.

Day 24. For the Egyptians, a west wind, or a south wind and hail, rain.

Day 25. 14½ hours: The last star of Eridanus goes into hiding. 15 hours: The star common to Pegasus and Andromeda rises in the morning. For Hipparchus, the cold north wind blows.

Day 26. For the Egyptians, windy conditions.

Day 27. [lacking]

Day 28. For Hipparchus and Euctemon, the cold bird-bringing winds begin to blow, and the season for the swallow to appear.

Day 29. 13½ hours: The star common to Pegasus and Andromeda goes into hiding. 15 hours: The bright star of Cygnus sets in the evening. For the Egyptians and Philippus and Callippus, the swallow appears, and windy conditions. For Conon, the cold north wind begins to blow. For Eudoxus, rain for the swallow, and upon the 30th day the north wind blows, the so-called bird-bringing wind.

Day 30. For the Egyptians, the north bird-bringing wind, intermittent north-west wind. For Hipparchus, the cold north winds. For Metrodorus, the swallow appears, and it is indicative. For Democritus, [changeable[1]] days, the so-called halcyon days.

Month of Phamenōth

Day 1. 14½ days: The star common to Pegasus and Andromeda rises in the morning. 15½ hours: Arcturus rises in the evening. For Caesar and Dositheus, stormy weather, it is indicative.

Day 2. 14 hours: The star common to Pegasus and Andromeda goes into hiding.

Day 3. 15 hours: The bright star of Perseus rises in the morning.

Day 4. 14½ hours: The star common to Pegasus and Andromeda sets in the evening.

Day 5. 14 hours: The star common to Pegasus and Andromeda arises. 15 hours: Arcturus rises in the evening. For Hipparchus, a cold north or south wind blows.

Day 6. 14 hours: The last star of Eridanus goes into hiding. For the Egyptians, a southwest or a due south wind, hail. For Hipparchus, a cold north wind blows.

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[1] *poikilos.* The term literally means 'many colored', figuratively 'changeable.' This appears to be a contradiction since "halcyon" usually means 'tranquil.'

Day 7. 15 hours: The star common to Pegasus and Andromeda sets in the evening. 15½ hours: The bright star of Cygnus sets in the evening.

Day 8. 14½ hours: Arcturus rises in the evening. For Euctemon, a cold north wind blows.

Day 9. 15½ hours: The bright star of the northern Corona rises in the evening, and the star common to Pegasus and Andromeda sets in the evening. For the Egyptians, it is stormy. For Caesar, the swallow winds blow for 10 days.

Day 10. 13½ hours: The star common to Pegasus and Andromeda arises.

Day 11. 13½ hours: The bright star of the southern fish of Pisces arises, and the star in the right fore frog of the hoof of Centaurus sets in the morning. For the Egyptians, uncertain conditions. For Democritus, the cold bird-bringing winds blow for 9 days.

Day 12. 14 hours: Arcturus rises in the evening. For Eudoxus, stormy weather, and the kite appears, and it is indicative. For Metrodorus and Euctemon and Philippus, a cold north wind blows. For Hipparchus, the beginning of spring.

Day 13. 13½ hours: The star upon the tail of Leo sets in the morning. For the Egyptians, it drizzles. For Metrodorus and Euctemon, the north wind blows. For Dositheus, the kite begins to appear. For Hipparchus, a strong south wind.

Day 14. 15 hours: The bright star of the northern Corona rises in the evening. For the Egyptians and Callippus, a cold north wind blows.

Day 15. 13½ hours: Arcturus rises in the evening.

Day 16. 13½ hours: The last star of Eridanus goes into hiding. For Callippus, a moderate north wind blows.

Day 17. 13½ hours: Spica rises in the evening. 14½ hours: Spica rises in the evening. For the Egyptians, windy conditions. For Euctemon and

Philippus, the bird-bringing winds begin to blow, and the season of the kite appears.

Day 18. 14 hours: The star upon the tail of Leo sets in the morning. For the Egyptians, a west or a south wind blows. For Euctemon, a cold north wind blows. For Dositheus, the bird-bringing winds begin to blow. For Hipparchus, a due north or northwest wind.

Day 19. For the Egyptians and Euctemon, a cold north wind blows.

Day 20. 14 hours: The bright star of the northern fish of Pisces arises. 14½ hours: The bright star of the northern Corona rises in the evening.

Day 21. 14½ hours: The bright star of Perseus rises in the morning. For Callippus, the north wind blows, and the kite appears.

Day 22. For the Egyptians and Democritus, stormy weather, cold wind.

Day 23. For the Egyptians, cold winds until the equinox. For Hipparchus, the north wind blows.

Day 24. For Caesar, the kite appears, and the north wind blows.

Day 25. 14½ hours: The star upon the tail of Leo sets in the morning. For Eudoxus, the kite appears, and the north wind blows.

Day 26. Spring equinox. 14 hours: The bright star of the northern Corona rises in the evening.

Day 27. For Caesar, the north wind blows. For Hipparchus, rainy weather.

Day 28. For the Egyptians, thunder, indications. For Philippus and Callippus and Euctemon, rain and drizzle. For Hipparchus, indications.

Day 29. 15½ hours: The star called Capella rises in the morning. For the Egyptians and Conon and Meton, the equinox. For Eudoxus, the north wind blows.

Day 30. 13½ hours: Spica sets in the morning. For the Egyptians, the northwest wind blows. For Callippus, rain and falling snow.

Month of Pharmouthi

Day 1. 14 hours: Spica sets in the morning. For Meton and Callippus and Eudoxus, rain. For Euctemon and Democritus, it is indicative.

Day 2. 13½ hours: The bright star of the northern Corona rises in the evening. 14½ hours: Spica sets in the morning, and the star called Canopus goes into hiding. 15 hours: The star upon the tail of Leo sets in the morning. For Dositheus and Meton and Callippus, rainy weather.

Day 3. 14 hours: The bright star of Perseus rises in the morning. 14½ hours: The bright star of the northern fish of Pisces arises.

Day 4. 15½ hours: The bright star of the northern claw of the Claws of Scorpio rises in the evening. For the Egyptians and Conon, it is indicative. For Eudoxus, the weather becomes rainy.

Day 5. 15 hours: Spica sets in the morning.

Day 6. 15½ hours: The bright star of the southern claw of the Claws of Scorpio rises in the evening. For Eudoxus, rain, it is indicative.

Day 7. 13½ hours: The bright star of the southern claw of the Claws of Scorpio rises in the evening. 15½ hours: Spica sets in the morning.

Day 8. 15 hours: The bright star of the northern claw of the Claws of Scorpio rises in the evening. For the Egyptians, a west wind and hail. For Conon, it is indicative. For Eudoxus, rain.

Day 9. 14½ hours: The bright star of the northern claw of the Claws of Scorpio rises in the evening. For the Egyptians and Conon, a west or south wind and hail.

Day 10. 14 hours: The bright star of the northern claw of the Claws of Scorpio rises in the evening. 15½ hours: The bright star of Lyra rises

in the evening. For Hipparchus, a south wind and whirlwinds.

Day 11. 13½ hours: The bright star of the northern claw of the Claws of Scorpio rises in the evening. For Hipparchus and Dositheus, it is indicative.

Day 12. 15½ hours: The star upon the tail of Leo sets in the morning.

Day 13. 13 hours [lacuna]. For the Egyptians, a due south or southwest wind. For Eudoxus, rainy weather.

Day 14. 13½ hours: The bright star of Perseus rises in the morning. For the Egyptians, a ill-mixture of winds. For Hipparchus, rainy weather.

Day 15. For the Egyptians, instability of the air and rain. For Euctemon and Philippus, an ill-mixture of winds. For Hipparchus, rainy weather.

Day 16. For Eudoxus, a west wind and an ill-mixture of air, intermittent drizzle.

Day 17. 15½ hours: The star common to Eridanus and the foot of Orion goes into hiding.

Day 18. 15 hours: The star called Capella rises in the morning, and the bright star of the southern fish of Pisces arises. For Dositheus and Caesar, rainy weather.

Day 19. 15 hours: The bright star of Lyra rises in the evening. For the Egyptians, the clearing south wind, thunder, drizzle.

Day 20. 14 hours: The star called Canopus goes into hiding. For the Egyptians, indecision of winds. For Eudoxus and Euctemon, rainy weather and hail.

Day 21. 15 hours: The star common to Eridanus and the foot of Orion goes into hiding. 15½ hours: The bright star of the Hyades goes into hiding. For Metrodorus and Callippus, hail. For Euctemon and Philippus, a west wind.

Day 22. 13½ hours: The bright star of Perseus sets in the evening. For the Egyptians and Conon, hail and a west wind. For Caesar and Eudoxus, rainy weather.

Day 23. 15 hours: The bright star of the Hyades goes into hiding. For the Egyptians, windy drizzle.

Day 24. 14½ hours: The bright star of the Hyades goes into hiding, and the star common to Eridanus and the foot of Orion goes into hiding. 15½ hours: The middle star of the belt of Orion goes into hiding.

Day 25. For the Egyptians, a southwest or due south or northwest wind and an ill-mixture of air.

Day 26. 14 hours: The bright star of Perseus sets in the evening, and the bright star of the Hyades goes into hiding. 15½ hours: The bright star of Cygnus rises in the evening, and the star in the preceding shoulder of Orion goes into hiding. For Hipparchus, a south wind or cold arctic wind.

Day 27. 13½ hours: The bright star of the Hyades goes into hiding, and the bright star of the northern claw of the Claws of Scorpio sets in the morning. 15 hours: The middle star in the belt of Orion goes into hiding. For the Egyptians and Caesar, stormy weather. For Eudoxus, rain.

Day 28. 14 hours: The star common to Eridanus and the foot of Orion goes into hiding. 14½ hours: The bright star of Lyra rises in the evening. For the Egyptians, a southwest or a due south wind, rainy weather.

Day 29. 14 hours: The bright star of the southern claw of the Claws of Scorpio sets in the morning. 15 hours: The star in the preceding shoulder of Orion goes into hiding. For the Egyptians, a southwest or a due south wind and rainy weather. For Metrodorus and Callippus, occasional hail. For Democritus, it is indicative.

Day 30. For the Egyptians and Eudoxus, drizzle, rain.

Day 1. 14½ hours: The bright star of Perseus sets in the evening, and the middle star of the belt of Orion goes into hiding, and the bright star of the southern claw of the Claws of Scorpio sets in the morning. For Euctemon and Philippus, rainy weather and hail.

Day 2. 14½ hours: The star called Capella rises in the morning, and the star in the preceding shoulder of Orion goes into hiding. For the Egyptians, windy conditions. For Metrodorus and Callippus, damp weather.

Day 3. 13½ hours: The star common to Eridanus and the foot of Orion goes into hiding, and the star called Antares rises in the evening. 15½ hours: Sirius goes into hiding. For the Egyptians, winds. For Eudoxus, rain.

Day 4. 14 hours: The star in the preceding shoulder of Orion goes into hiding, and the middle star in the belt of Orion goes into hiding, and the so-called Antares rises in the evening. 14½ hours: The same. 15 hours: The same. For the Egyptians, calm or south wind and rainy weather. For Caesar, stormy weather.

Day 5. 13½ hours: The star called Canopus goes into hiding. 15 hours: The bright star of the southern claw of the Claws of Scorpio sets in the morning. For the Egyptians, it is indicative. For Euctemon and Philippus, calm or south wind, drizzle.

Day 6. 13½ hours: The star in the right fore frog of the hoof of Centaurus rises in the evening. 15 hours: The bright star of Perseus sets in the evening. 15½ hours: The star in the following shoulder of Auriga rises in the morning, and the star in the following shoulder of Orion goes into hiding. For the Egyptians, drizzle.

Day 7. 13½ hours: The star in the preceding shoulder of Orion goes into hiding, and the middle star in the belt of Orion goes into hiding. 15 hours: Sirius goes into hiding.

Day 8. 14 hours: The bright star of Lyra rises in the evening. 15 hours:

The bright star of Cygnus rises in the evening, and the star in the following shoulder of Orion goes into hiding. 15½ hours: The bright star in the southern claw of the Claws of Scorpio sets in the morning. For the Egyptians, a northwest wind and drizzle or a due south wind, thunder.

Day 9. 14 hours: The star called Capella rises in the morning. 15½ hours: the bright star of the southern fish of Pisces arises. For the Egyptians, drizzle. For Eudoxus, rain.

Day 10. 13½ hours: The bright star of the northern claw of the Claws of Scorpio sets in the morning. For Dositheus, rainy weather.

Day 11. 14½ hours: The star in the following shoulder of Orion goes into hiding. For the Egyptians, windy conditions.

Day 12. 13½ hours: The star called Capella rises in the morning. 14½ hours: Sirius goes into hiding. 15½ hours: The bright star of Perseus sets in the evening. For the Egyptians, windy conditions.

Day 13. For the Egyptians, a due west wind or a northwest wind and rainy weather. For Eudoxus and Dositheus, rainy weather.

Day 14. 14 hours: The star in the following shoulder of Orion goes into hiding, and the bright star of the northern claw of the Claws of Scorpio sets in the morning. For the Egyptians, a thunder-storm.

Day 15. For the Egyptians, rain, the beginning of summer. For Euctemon and Philippus, it is indicative.

Day 16. 13½ hours: Arcturus sets in the morning, and the star in the following shoulder of Orion goes into hiding. For Dositheus, it is indicative.

Day 17. 13½ hours: The star called Capella sets in the evening, and the bright star of Lyra rises in the evening. 14 hours: Sirius goes into hiding, and the star in the right fore frog of the hoof of Centaurus rises in the evening. For the Egyptians, a due west or a northwest wind. For Caesar, rain. For Metrodorus and Eudoxus and Hipparchus, it is

indicative. And the beginning of summer.

Day 18. 13½ hours: The star called Antares sets in the morning. 14½ hours: The bright star of Cygnus rises in the evening. 15 hours: The star in the following shoulder of Auriga rises in the morning. For the Egyptians, a due west or a southwest wind, indications. For Eudoxus and Conon, rainy weather.

Day 19. 14½ hours: The star called Antares sets in the morning. For the Egyptians and Eudoxus and Callippus, indications.

Day 20. 14 hours: The star called Capella sets in the evening. 15 hours: The star called Antares sets in the morning. For Caesar, indications, rainy weather.

Day 21. 15½ hours: The star called Antares sets in the morning. For Caesar, it is indicative.

Day 22. For the Egyptians, a south or due east wind. For Eudoxus, rainy weather. For Hipparchus, a south or arctic wind.

Day 23. 13½ hours: The star in the following shoulder of Auriga goes into hiding, and Sirius goes into hiding. For the Egyptians, a lightning and thunder storm. For Eudoxus, the beginning of summer, rainy weather.

Day 24. 14½ hours: The star called Capella sets in the evening, and the star in the following shoulder of Auriga rises in the morning. 15½ hours: The bright star of Aquila rises in the evening. For the Egyptians and Hipparchus, it drizzles and is indicative.

Day 25. 14 hours: The star in the following shoulder of Auriga goes into hiding. 15 hours: The bright star of the northern claw of the Claws of Scorpio sets in the morning.

Day 26. 14 hours: Arcturus sets in the morning. For the Egyptians, a northwest or a due west wind. For Dositheus, a south wind. For Caesar, it is stormy.

Day 27. 15 hours: The bright star of Aquila rises in the evening. 15½ hours: Procyon goes into hiding.

Day 28. 14½ hours: The star in the following shoulder of Auriga sets in the evening. 15 hours: The star called Capella sets in the evening.

Day 29. 15½ hours: The star down upon the knee of Sagittarius sets in the morning. For the Egyptians, windy conditions. For Euctemon and Philippus, indications.

Day 30. 14 hours: The bright star of Cygnus rises in the evening. For Euctemon and Philippus and Hipparchus, indications.

Month of Payni

Day 1. 13½ hours: The star in the following shoulder of Auriga arises. 15 hours: The star in the following shoulder of Auriga sets in the evening, and Procyon goes into hiding. 15½ hours: The bright star of the northern claw of the Claws of Scorpio sets in the morning. For the Egyptians, excessive north wind. For Callippus and Euctemon, it is indicative.

Day 2. 14½ hours: The bright star of Aquila rises in the evening. For the Egyptians, indications. For Metrodorus and Callippus, south winds.

Day 3. 13½ hours: The bright star of the Hyades arises. 14½ hours: Procyon goes into hiding. For the Egyptians and Democritus, rainy weather.

Day 4. For Hipparchus, a south or west wind.

Day 5. 14½ hours: The star in the right fore frog of Centaurus rises in the evening. 15½ hours: The star called Capella sets in the evening, and the star in the following shoulder of Auriga sets in the evening. For Caesar, the south wind blows.

Day 6. 14 hours: Procyon goes into hiding, and the bright star of Aquila rises in the evening. 15 hours: The star down upon the knee of

Sagittarius sets in the morning.

Day 7. 14 hours: The bright star of the Hyades arises. 14½ hours: Arcturus sets in the morning. For the Egyptians, a west wind. For Eudoxus and Dositheus, damp weather.

Day 8. For the Egyptians, the northwest or due west wind blows.

Day 9. 14½ hours: The star down upon the knee of Sagittarius sets in the morning. 15½ hours: The bright star of Hydra goes into hiding. For the Egyptians, a northwest wind and drizzle. For Democritus, there is rain-water.

Day 10. 13½ hours: The bright star of Cygnus rises in the evening. 15½ hours: The star upon the head of the following twin of Gemini goes into hiding. For Caesar, thunder and rain.

Day 11. 13½ hours: The bright star of Aquila rises in the evening, and the star upon the head of the preceding twin of Gemini goes into hiding. 15 hours: The star upon the head of the following twin of Gemini goes into hiding. For the Egyptians, it drizzles. For Caesar, thunder, rain.

Day 12. 14½ hours: The star upon the head of the following twin of Gemini goes into hiding.

Day 13. 14 hours: The star upon the head of the preceding twin of Gemini goes into hiding, and the star down upon the knee of Sagittarius sets in the morning. 14½ hours: The star upon the head of the preceding twin of Gemini goes into hiding.

Day 14. 14 hours: The star upon the head of the following twin of Gemini goes into hiding. 14½ hours: The bright star of the Hyades arises. 15 hours: The star upon the head of the preceding twin of Gemini goes into hiding. 15½ hours: The star upon the head of the preceding twin of Gemini goes into hiding.

Day 15. 13½ hours: The star upon the head of the following twin of Gemini goes into hiding, and the star down upon the knee of Sagittarius rises in the evening, and the star down upon the knee of Sagittarius sets

in the morning. 15 hours: The bright star of Hydra goes into hiding. For the Egyptians, a due west or northwest wind, thunder.

Day 16. 13½ hours: The bright star of the northern Corona sets in the morning.

Day 17. 15 hours: The bright star of the Hyades arises. For the Egyptians, it drizzles throughout the day.

Day 18. 14 hours: The star down upon the knee of Sagittarius rises in the evening. 15 hours: Arcturus sets in the morning.

Day 19. For the Egyptians, a due west or northwest wind, it drizzles.

Day 20. 14½ hours: The bright star of Hydra goes into hiding, and the star down upon the knee of Sagittarius rises in the evening.

Day 21. 13½ hours: The star in the preceding shoulder of Orion arises, and the last star of Eridanus arises. For the Egyptians, it drizzles.

Day 22. 15½ hours; The bright star of the Hyades arises.

Day 23. For the Egyptians, burning heat. For Dositheus, indications.

Day 24. 15 hours: The star down upon the knee of Sagittarius rises in the evening. For the Egyptians, a west or south wind and burning heat.

Day 25. 14 hours: The star in the preceding shoulder of Orion arises, and the bright star of Hydra goes into hiding. For the Egyptians, rain.

Day 26. For the Egyptians, a west wind, inundation, thunder.

Day 27. 13½ hours: The star in the following shoulder of Orion arises. 14 hours: The bright star of the northern Corona sets in the morning. 14½ hours: The star in the right fore frog of the hoof of Centaurus goes into hiding.

Day 28. 13½ hours: The star common to Eridanus and the foot of Orion arises. For Democritus, it is indicative.

Day 29. 15½ hours: The star down upon the knee of Sagittarius rises in the evening. For Hipparchus, the west or south wind blows.

Day 30. 13½ hours: The bright star of Hydra goes into hiding. 14½ hours: The star in the preceding shoulder of Orion arises. 15½ hours: Arcturus sets in the morning.

Month of Epiphi

Day 1. Summer solstice. 13½ hours: The middle star in the belt of Orion arises. 14 hours: The star in the following shoulder of Orion arises. For the Egyptians, a west wind and burning heat.

Day 2. 15½ hours: The bright star of Perseus rises in the evening.

Day 3. For the Egyptians and Dositheus, the west wind blows.

Day 4. For Callippus and Dositheus, indications. For Democritus, a south wind and rain-water in the morning, then the advance northern winds for 7 days.

Day 5. 14 hours: The star common to Eridanus and the foot of Orion arises. 15 hours: The star in the preceding shoulder of Orion arises. For Eudoxus, it is indicative.

Day 6. 13½ hours: The star upon the head of the preceding twin of Gemini arises. 14 hours: The middle star in the belt of Orion arises, and the last star of Eridanus arises, and the star upon the head of the preceding twin of Gemini arises. For the Egyptians, wind and an ill-mixture of air.

Day 7. 14½ hours. The bright star of the northern Corona sets in the morning.

Day 8. 15 hours: The star upon the head of the preceding twin of Gemini arises. 15½ hours: The star common to Pegasus and Andromeda rises in the evening.

Day 9. 15½ hours: The star upon the head of the preceding twin of Gemini arises. For the Egyptians and Caesar, a south wind and burning heat.

Day 10. 14½ hours: The star in the following shoulder of Orion arises. 15½ hours: The star upon the heart of Leo goes into hiding. For the Egyptians, a northwest wind and rainy weather.

Day 11. 14½ hours: The middle star in the belt of Orion arises. 15½ hours: The star in the preceding shoulder of Orion arises. For the Egyptians, a due west or northwest wind and thunder. For Metrodorus, a northwest wind. For Callippus, a south wind. For Hipparchus, a south or west wind.

Day 12. 13½ hours: The star upon the head of the following twin of Gemini arises. 14½ hours: The star common to Eridanus and the foot of Orion arises. For the Egyptians, a due west or northwest wind and burning heat.

Day 13. 15 hours: The star upon the heart of Leo goes into hiding. For the Egyptians, it is indicative. For Hipparchus, the winds in advance of Sirius.

Day 14. 14½ hours: The star upon the head of the following twin of Gemini arises. For Meton, damp weather.

Day 15. 15½ hours: the star in the following shoulder of Orion arises. For the Egyptians, a northwest or the due west wind. For Euctemon and Philippus, damp weather and the beginning of the advance winds.

Day 16. 14½ hours: The star upon the heart of Leo goes into hiding. For the Egyptians, it is indicative, bad air.

Day 17. 15 hours: The star common to Pegasus and Andromeda rises in the evening, and the middle star in the belt of Orion arises. 15½ hours: the star upon the head of the following twin of Gemini arises.

Day 18. 14 hours: The star upon the heart of Leo goes into hiding. 15 hours: The bright star of the northern Corona sets in the morning, and

the star common to Eridanus and the foot of Orion arises. For the Egyptians, the winds in advance of the season blow. For Metrodorus, a due west or northwest wind.

Day 19. 13½ hours: Procyon arises. For Hipparchus, indecision of the winds.

Day 20. For the Egyptians, burning heat. For Caesar, much wind. For Hipparchus, the north wind begins to blow.

Day 21. 13½ hours: The star upon the heart of Leo goes into hiding.

Day 22. 13½ hours: Sirius arises. 14 hours: Procyon arises. 14½ hours: The last star of Eridanus arises. For the Egyptians, much wind and occasional damp weather. For Democritus, rain-water, squalls.

Day 23. 15 hours: The bright star of Perseus rises in the evening. 15½ hours: The middle star in the belt of Orion arises. For the Egyptians and Dositheus, a south wind and burning heat.

Day 24. 14½ hours: Procyon arises. 15½ hours: The star common to Eridanus and the foot of Orion arises. For Hipparchus, the Etesian winds begin to blow.

Day 25. For the Egyptians, a due west or a northwest wind and burning heat.

Day 26. 14½ hours: The star common to Pegasus and Andromeda rises in the evening. 15 hours: Procyon arises. For the Egyptians, a northwest or due west wind.

Day 27. 13½ hours: The bright star of Aquila sets in the morning. 15½ hours: The bright star of the southern fish of Pisces sets in the morning. for Metrodorus and Euctemon and Philippus, the Etesian winds blow, and the beginning of late summer. For Caesar, the advance winds blow.

Day 28. 14 hours: Sirius arises. 15½ hours: The bright star of the northern Corona sets in the morning, and Procyon arises. For the Egyptians, a west wind and burning heat throughout the day. For

Euctemon and Philippus, bad air, the advance winds blow.

Day 29. 14 hours: The star in the right fore frog of the hoof of Centaurus goes into hiding. For the Egyptians, the Etesian winds begin to blow. For Metrodorus and Callippus, windy conditions. For Euctemon, stormy weather at sea.

Day 30. For Eudoxus, the Etesian winds blow. For Metrodorus and Callippus, windy conditions.

Month of Mesori

Day 1. For the Egyptians, a west or south wind. For Eudoxus and Callippus, a south wind.

Day 2. 14 hours: The bright star of Aquila sets in the morning. 15 hours: The bright star of the southern fish of Pisces sets in the morning. For Metrodorus and Callippus and Conon and Democritus and Hipparchus, a south wind and burning heat.

Day 3. For Euctemon and Dositheus, damp and stifling weather.

Day 4. 13½ hours: The bright star of Lyra sets in the morning. 14 hours: The star common to Eridanus and Andromeda rises in the evening. 14½ hours: Sirius arises.

Day 5. For the Egyptians, burning heat. For Eudoxus, damp weather and the beginning of late summer. For Dositheus, the Etesian winds begin.

Day 6. 14½ hours: The bright star of Aquila sets in the morning, and the bright star of the southern fish of Pisces sets in the morning. For the Egyptians, a northwest or due west wind and burning heat. For Eudoxus, the Etesian winds blow.

Day 7. For Caesar, a south wind blows.

Day 8. For Hipparchus, burning heat.

Day 9. 14 hours: The bright star of the southern fish of Pisces sets in the morning. 15 hours: Sirius arises.

Day 10. 15 hours: The bright star of Aquila sets in the morning. 15½ hours: The star called Capella rises in the evening. For Caesar, indications. For Eudoxus and Dositheus, damp weather.

Day 11. 14½ hours: The bright star of Perseus rises in the evening. 15 hours: The last star of Eridanus arises. For Eudoxus, intensely burning heat.

Day 12. 13½ hours: The bright star of the southern fish of Pisces sets in the morning. For the Egyptians, burning heat. For Dositheus, stifling heat, and after this the Etesian winds.

Day 13. 13½ hours: The star common to Pegasus and Andromeda rises in the evening. 14 hours: The bright star of Lyra sets in the morning.

Day 14. 15½ hours: Sirius arises.

Day 15. For the Egyptians, a northwest wind, intensely burning and stifling heat.

Day 16. For the Egyptians, a northwest or a south wind, foggy air.

Day 17. For the Egyptians, intensely burning and stifling heat.

Day 18. 13½ hours: The star upon the heart of Leo arises. For the Egyptians, thunder. For Eudoxus, great wind. For Hipparchus, disorderly winds.

Day 19. The beginning of fall. 13½ hours: The bright star of the southern fish of Pisces rises in the evening. 14½ hours: The star upon the heart of Leo arises. For the Egyptians, burning heat.

Day 20. 15 hours: The star upon the heart of Leo arises. For Caesar, it is indicative.

Day 21. For Caesar, it is indicative, stifling.

Day 22. 13½ hours: The star upon the tail of Leo goes into hiding, and the bright star of Hydra arises.

Day 23. 13½ hours: The star in the right fore frog of the hoof of Centaurus goes into hiding. 14 hours: The star upon the tail of Leo goes into hiding. For Caesar, a veering around [of winds].

Day 24. 14 hours: The bright star of Hydra arises. For Eudoxus, it is indicative.

Day 25. 15½ hours: The star upon the tail of Leo goes into hiding.

Day 26. 14 hours: The bright star of the southern fish of Pisces rises in the evening. For the Egyptians, a south or west wind. For Democritus, it is indicative of rain-water and winds.

Day 27. 14½ hours: The bright star of Hydra arises. For the Egyptians, burning heat and fog.

Day 28. 14 hours: The bright star of Perseus rises in the evening.

Day 29. 15 hours: The bright star of Hydra arises. For the Egyptians and Caesar, it is indicative, bad air. For Eudoxus, it is accustomed to thunder.

Day 30. 15½ hours: The star in the following shoulder of Auriga rises in the evening. For the Egyptians, a west or northwest wind.

Epagonal Days[1]

Day 1. 15 hours: The bright star of Lyra sets in the morning. 15½ hours: The bright star of Hydra arises. For Eudoxus and Metrodorus, it is indicative.

Day 2. 14 hours: The star called Canopus arises. 14½ hours: The bright

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[1] See Appendix V.

star of the southern fish of Pisces rises in the evening. For the Egyptians, burning heat. For Eudoxus and Caesar, it is indicative. For Hipparchus, a south wind, and the Etesian winds cease.

Day 3. 14½ hours: Spica goes into hiding. 15½ hours: The star upon the tail of Leo arises. For Hipparchus, whirlwinds.

Day 4. 15 hours: The star upon tail of Leo arises. For Callippus, it is indicative.

Day 5. 13½ hours: The bright star of Cygnus sets in the morning. For the Egyptians, a west or a northwest wind.

Epilogue

The register had such an order of exposition in the interest of being handy. It is perhaps not out of place to bring together under one heading the number of assembled fixed stars with the number of total phases in order to cross-check for any of those that got omitted through errors of writing; furthermore, for the men indicating the changes in weather, to summarize in which areas each happens to have observed, in order that we may in a sense more appropriately adapt the weather changes of the determinate regions to those similar regions around the same parallel.

There are 15 stars of the 1st magnitude:

The star called Capella, the bright star of Lyra, Arcturus, the star on the heart of Leo, the star on the tail of Leo, the bright star of the Hyades, Procyon, the star in the following shoulder of Orion, Spica, the star common to Eridanus and the foot of Orion, Sirius, the bright star of the southern fish of Pisces, the last star of Eridanus, the star called Canopus, the star in the right fore frog of the Centaur's hoof.

There are another 15 of the 2nd magnitude:

The bright star of Perseus, the star in the following shoulder of Auriga, the bright star of Cygnus, the bright star of Corona, the star on the head of the preceding Twin, the star on the head of the following Twin, the star common to Pegasus and Andromeda, the bright star of Aquila, the star in the preceding shoulder of Orion, the bright star of Hydra, the bright star of the northern claw of the Claws, the middle star of the belt of Orion, the bright star of the southern claw of the Claws, Antares, the star down upon the knee of Sagittarius.

Although each of these makes 4 phases a year for one of the parallels in which they rise and set, for the star called Canopus and the star in the right fore frog of the Centaur's hoof, each happens to make both a setting and rising in only the 3 first parallels (from the south) of the 5 set out, while for the last bright star of Eridanus this happens only in the four first parallels; the remaining 27 make risings and setting in the 5 parallels. Thus the total multitude of phases comes to 580.

And I have recorded the indications for these and drawn them up

according to the Egyptians and Dositheus, Philippus, Callippus, Euctemon, Meton, Conon, Metrodorus, Eudoxus, Caesar, Democritus, Hipparchus. Of these, the Egyptians observed in our area, Dositheus in Cos, Philippus in Hellespont, Meton and Euctemon in Athens and Cyclades and Macedonia and Thrace, Conon and Metrodorus in Italy and Sicily, Eudoxus in Asia and Sicily and Italy, Caesar in Italy, Hipparchus in Bithynia, Democritus in Macedonia and Thrace. Therefore, one should especially fit the indications of the Egyptians to the areas around this parallel, that is, the parallel in which the greatest of the days is of 14 standard hours, those of Dositheus and Philippus to the parallel in which the greatest of the days is of 14½ standard hours, those of Democritus and Caesar and Hipparchus to that in which the greatest of the days is of 15 standard hours, those of Callippus and Eudoxus and Meton and Euctemon and Metrodorus and Conon to the parallels in which the magnitude of the greatest days stretches from 14½ to 15 standard hours.

Calendar or Register Attributed to Geminus[1]

The Times in Which the Sun Traverses Each of the *Zōidia*, and the Indications That Arise for Each *Zōidion*, as They Have Been Recorded.

We begin from the summer solstice.

The Sun traverses Cancer in 31 days.

On the 1st day, then: For Callippus, Cancer begins to rise; summer solstice; and it is indicative.

On the 9th day: For Eudoxus, a south wind blows.

On the 11th day: For Eudoxus, Orion completely arises in the morning.

On the 13th day: For Euctemon, Orion completely arises.

On the 16th day: For Dositheus, Corona begins to set in the morning.

On the 23rd day: For Dositheus, Sirius becomes visible in Egypt.

On the 25th day: For Meton, Sirius arises in the morning.

On the 27th day: For Euctemon, Sirius arises. For Eudoxus, Sirius arises in the morning; and for the following 55 days the Etesian winds blow; but for the five first days they are called the advance winds. For Callippus, Cancer comes to its end while rising, windy.

On the 28th day: For Euctemon, Aquila sets [in the morning]; a storm ensues at sea.

On the 30th day: For Callippus: Leo begins to rise. A south wind blows; and Sirius becomes visible upon rising.

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[1] This has been included as a comparison to Ptolemy's calendar in the *Phases*. [RH]

On the 31st day: For Eudoxus, a south wind blows.

The Sun traverses Leo in 31 days.

On the 1st day, then: For Euctemon, Sirius becomes visible, and stifling heat ensues.

On the 5th day: For Eudoxus, Aquila sets in the morning.

On the 10th day: For Eudoxus, Corona sets [in the morning].

On the 12th day: For Callippus, Leo, rising in the middle, makes especially stifling heat.

On the 14th day: For Euctemon, especially stifling heat arises.

On the 16th day: For Eudoxus, it is indicative.

On the 17th day: For Euctemon, Lyra sets; and it pours rain; and the Etesian winds cease; and Pegasus arises [in the evening].

On the 18th day: For Eudoxus, Dolphin sets in the morning. For Dositheus, Vindemiatrix sets acronycally.

On the 22 day: For Eudoxus, Lyra sets in the morning; and it is indicative.

On the 29th day: For Eudoxus, it is indicative. For Callippus, Virgo arises; it is indicative.

The Sun traverses Virgo in 30 days.

On the 5th day, then: For Eudoxus, a strong wind blows, and thereupon it thunders. For Callippus, the shoulders of Virgo arise; and the Etesian winds abate.

On the 10th day: For Euctemon, Vindemiatrix appears; and Arcturus arises, and Pegasus sets [in the morning]; a storm at sea; south wind.

For Eudoxus, rain, thunder; a strong wind blows.

On the 17th day: For Callippus, Virgo, arising in the middle, is indicative; and Arcturus is visible upon rising.

On the 19th day: For Eudoxus, Arcturus arises in the morning; and for the following seven days [winds] blow; fair weather for the most part; when the time is up, a wind arises from the east.

On the 20th day: For Euctemon, Arcturus is visible; beginning of autumn; and Capella arises [in the evening]; and then it is indicative; stormy weather at sea.

On the 24th day: For Callippus, Spica arises in Virgo; it rains.

The Sun traverses Libra in 30 days.

On the 1st day, then: For Euctemon, the autumn equinox; and it is indicative. For Callippus, Aries begins to set; the autumn equinox.

On the 3rd day: For Euctemon, the Haedi arise in the evening; it is stormy.

On the 4th day: For Eudoxus, Capella arises acronycally.

On the 5th day: For Euctemon, the Pleiades appear in the evening; it is indicative. For Callippus, Virgo comes to its end while rising.

On the 7th day: For Euctemon, Corona arises; it is indicative.

On the 8th day: for Eudoxus, the Pleiades arise [acronycally].

On the 10th day: For Eudoxus [Corona] arises in the morning.

On the 12th day: For Eudoxus, Scorpio begins to set acronycally; and stormy weather ensues, and a strong wind blows.

On the 17th day: For Eudoxus, Scorpio completely sets acronycally. For Callippus, the Claws begin to rise; it is indicative.

On the 19th day: For Eudoxus, north and south winds blow.

On the 22nd day: For Eudoxus, the Hyades arise acronycally.

On the 28th day: For Callippus, the tail of Taurus sets; it is indicative.

On the 29th day: For Eudoxus, a north and a south wind blow.

On the 30th day: For Euctemon, much stormy weather at sea.

The Sun traverses Scorpio in 30 days.

On the 3rd day, then: For Dositheus, it is stormy.

On the 4th day: For Democritus, the Pleiades set at the same time as the Sun; wintry winds for the most part, and cold, and frost already; thereupon it is usually windy; the trees begin to loose their leaves. For Callippus, the forehead of Scorpio arises; it is windy.

On the 5th day: For Euctemon, Arcturus sets in the evening; and strong winds blow.

On the 8th day: For Eudoxus, Arcturus sets acronycally; and it is indicative; and the wind blows.

On the 9th day: For Callippus, the head of Taurus sets; rains.

On the 10th day: For Euctemon, Lyra arises [in the morning]; and thereupon it is stormy with rain.

On the 12th day: For Eudoxus, Orion begins to arise acronycally.

On the 13th day: For Democritus, Lyra arises at the same time the Sun comes up; and the air becomes wintry for the most part.

On the 14th day: For Eudoxus, rainy weather.

On the 15th day: For Euctemon, the Pleiades set; and it is indicative; and Orion begins [to set. And when it begins] to set, while its middle

sets, and when it comes to its end while setting, it is stormy.

On the 16th day: For Callippus, the bright star in Scorpio rises; it is indicative; and the Pleiades set visibly.

On the 18th day: For Eudoxus, Scorpio begins to arise in the morning.

On the 19th day: For Eudoxus, the Pleiades set in the morning, and Orion begins to set in the morning; and it is stormy.

On the 21st day: For Eudoxus, Lyra arises in the morning.

On the 27th day: For Euctemon, the Hyades set; and it pours rain.

On the 28th day: For Callippus, the horns of Taurus set; rainy weather.

On the 29th day: For Eudoxus, the Hyades set [in the morning]; and it is excessively stormy.

The Sun traverses Sagittarius in 29 days.

On the 7th day, then: For Euctemon, Sirius sets; and thereupon it is stormy. For Callippus, Sagittarius begins to rise, and Orion sets visibly; it is stormy.

On the 8th day: For Eudoxus, Orion sets [completely] in the morning.

On the 10th day: For Euctemon, the sting of Scorpio arises.

On the 12th day: For Eudoxus, Sirius sets in the morning; it is stormy.

On the 14th day: For Eudoxus, rain.

On the 15th day: For Euctemon, Aquila arises; a south wind blows.

On the 16th day: For Democritus, Aquila arises at the same time as the Sun; and it is usually indicative of thunder and lightning and rain or wind or both for the most part. For Eudoxus, Sirius arises acronycally; rainy weather. For Callippus, Gemini is at its middle while setting;

damp weather.

On the 19th day: For Euctemon, Capella sets.

On the 21st day: For Eudoxus, Scorpio [completely] arises in the morning; and it is stormy.

On the 23rd day: For Eudoxus, Capella sets in the morning.

On the 26th day: For Eudoxus, Aquila arises in the morning.

The Sun traverses Capricorn in 29 days.

On the 1st day, then: For Euctemon, the winter solstice; it is indicative. For Callippus, Sagittarius comes to its end while rising; the winter solstice; it is stormy.

On the 2nd day: For Euctemon, Dolphin arises; it is stormy.

On the 4th day: For Eudoxus, the winter solstice[1]; it is stormy.

On the 7th day: For Euctemon, Aquila sets in the evening; and it is indicative.

On the 9th day: For Eudoxus, Corona sets acronycally.

On the 12th day: For Democritus, a south wind blows [for the most part]. For Eudoxus, Dolphin arises in the morning.

On the 14th day: For Euctemon, moderately stormy weather; thereupon much wintry south wind blows at sea.

On the 15th day: For Callippus, Capricorn begins to rise; south wind.

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[1] Note that Eudoxus appears to have used one of the various Hellenistic tropical zodiacs in which the vernal point was not at 0° Aries. See also the entry for the 6th day of Aries. [RH]

On the 16th day: For Euctemon, a wintry south wind at sea.

On the 18th day: [For Eudoxus, Aquila] sets acronycally; and a south wind blows.

On the 27th day: For Euctemon, Dolphin sets in the evening. For Callipus, Cancer comes to its end while setting; it is stormy.

The Sun traverses Aquarius in 30 days.

On the 2nd day, then: For Callippus, Leo begins to set; wet weather.

On the 3rd day: For Euctemon, Lyra sets in the evening; wet weather. For Democritus, [unlucky] stormy weather.

On the 4th day: For Eudoxus, Dolphin sets acronycally.

On the 11th day: For Eudoxus, Lyra sets acronycally; wet weather.

On the 14th day: For Eudoxus, fair weather; sometimes the west wind also blows.

On the 16th day: For Democritus, a west wind begins to blow [and persists] for 43 days from the solstice.

On the 17th day: For Euctemon, the season for the west wind to blow. For Callippus, Aquarius rises in its middle; a west wind blows.

On the 25th day: For Euctemon, [Pegasus] sets in the evening; and thereupon it is excessively stormy.

The Sun traverses Pisces in 30 days.

On the 2nd day, then: [For Euctemon], it is the season for the swallow to appear; and the bird-bringing winds blow. For Callippus, Leo sets while leaving off; and the swallow appears; it is indicative.

On the 4th day: For Democritus, the changeable[1] days begin, which are called halcyon. For Eudoxus, Arcturus arises acronycally; and there is rain; and the swallow appears; and the north wind blows for 30 days, and especially the so-called bird-bringing winds.

On the 12th day: For Euctemon, Arcturus arises in the evening, and Vindemiatrix is visible; thereupon a cold north wind blows.

On the 14th day: For Democritus, cold winds blow, the so-called bird-bringing winds, for about nine days. For Euctemon, Pegasus arises; thereupon cold north wind.

On the 17th day: For Eudoxus, it is stormy; and the kite appears. For Callippus, the northern fish of Pisces arises; the north wind abates.

On the 21st day: For Eudoxus, Corona arises acronycally; the bird-bringing winds begin to blow.

On the 22nd day: For Euctemon, the kite appears; the bird-bringing winds blow until the equinox.

On the 29th day: For Euctemon, the first stars of Scorpio set; thereupon a cold north wind blows.

On the 30th day: For Callippus, the southern fish of Pisces comes to its end while arising; the kite appears; the north wind blows.

The Sun traverses Aries in 31 days.

On the 1st day, then: For Callippus, the knot of Pisces rises; the spring equinox. For Euctemon, equinox, light drizzle; it is excessively stormy; it is indicative.

On the 3rd day: For Callippus, Aries begins to arise; rain and falling snow.

[1] See Page 28, note 1.

On the 6th day: For Eudoxus, equinox; there is rain.

On the 10th day: For Euctemon, the Pleiades go into hiding.

On the 13th day: For Eudoxus, the Pleiades set acronycally, and Orion begins to set acronycally; there is rain. For Democritus, the Pleiades go into hiding at the same time that the Sun sets and remains invisible for 40 nights.

On the 21st day: For Eudoxus, the Hyades set acronycally.

On the 23rd day: For Euctemon, the Hyades go into hiding; and thereupon it hails, and the west wind blows. For Callippus, the Claws begin to set; wet [weather], but many times hail also.

On the 27th day: For Eudoxus, Lyra arises acronycally.

The Sun traverses Taurus in 32 days.

On the 1st day, then: For Eudoxus, Orion completely sets acronycally; wet weather. For Callippus, Aries comes to its end while arising; wet weather, but many times hail also.

On the 4th day: For Euctemon, Sirius goes into hiding; and there is hail. For him, Lyra arises [in the evening]. For Eudoxus, Sirius sets acronycally; and there is rain. For Callippus, the tail of Taurus arises; damp weather.

On the 7th day: For Eudoxus, there is rain.

On the 8th day: For Euctemon, Capella arises [in the morning]; fair weather or driving rain from the south.

On the 9th day: For Eudoxus, Capella arises in the morning.

On the 11th day: For Eudoxus, Scorpio begins to set in the morning; and there is rain.

On the 13th day: For Euctemon, the Pleiades arises; the beginning of

summer; and it is indicative. For Callippus, the head of Taurus arises; it is indicative.

On the 21st day: For Eudoxus, Scorpio sets completely in the morning.

On the 22nd day: For Eudoxus, The Pleiades arise [in the morning]; and it is indicative.

On the 25th day: For Euctemon, Capella sets in the evening.

On the 30th day: For Euctemon, [Sagitta] arises in the evening.

On the 31st day: For Euctemon, Aquila arises in the evening.

On the 32nd day: For Euctemon, Arcturus sets [in the morning]; it is indicative. For Callippus, Taurus comes to its end while rising. For Euctemon, the Hyades arise [in the morning]; it is indicative.

The Sun traverses Gemini in 32 days.

On the 2nd day, then: For Callippus, Gemini begins to arise; damp weather.

On the 5th day: For Eudoxus, the Hyades arise in the morning.

On the 7th day: For Eudoxus, Aquila arises acronycally.

On the 10th day: For Democritus, there is rain water.

On the 13th day: For Eudoxus, Arcturus sets in the morning.

On the 18th day: For Eudoxus, Dolphin arises acronycally.

On the 24th day: For Euctemon, the shoulder of Orion arises. For Eudoxus, Orion begins to arise [in the morning].

On the 29th day: For Democritus, Orion begins to arise, and it is usual for there to be indications with it.

Appendix I
Translation Conventions

The following words consistently translate the indicated Greek word.

ruler, rulership: *oikodespotēs, oikodespoteia*
ruler: *kurios*
master, mastership: *despotēs, despoteia*
-lord: *-koratōr* (as in *horatokratōr*, lord of boundaries)
-steward: *-dektōr* (as in *oikodektōr*, steward of the house)

zōidion: zōidion (See **General Note** in Paulus Alexandrinus.)
place: *topos* (See **General Note** in Paulus Alexandrinus.)

sect: *hairesis*
boundaries: *horia*
face: *prosōpon*
trigon: *trigōnon*, i.e triplicity.
house: *oikos*
dwelling: *oikotēr*
exaltation: *hupsōma*
depression: *tapeinōma*

figure: *schēma*
to figure: *schēmatizō*
to configure: *suschēmatizō*
to come to the attention of (by application, etc): *hupodedeiktai*

to contemplate: *theōreō*
to regard: *epitheōreō*
to scrutinize: *katopteuō*
to testify or bear witness to: *epimarturō*

All four of the above words appear to refer to aspect relationships. The words *theoreō* and *katopteuō* refer to aspects in either direction, i.e., into preceding and succeeding signs. However, *katopteuō* seems to have a negative overtone suggesting that it refers particularly to difficult aspects. The word *epitheoreō* is limited to aspects into the succeeding signs but, like *theoreō*, can refer to both difficult and good aspects.

hōroskopos: hōroskopos
to mark the birth-hour: *horoskōpeō*
to divide the hour: *Hōronomeō* See the **General Note** to the Anonymous.
midheaven: *mesouranema*
to culminate: *mesouraneō*

pivot: *kentron*
pre-ascension: *proanophora*
post-ascension: *epanophora*
decline: *apoklima*

rise: *anatellō*
arise: *epitellō*
set: *duneō*
hide: *kruptō*
co-rise: *paranatellō* See **General Note** in the Anonymous.
ascend, (of nodes): *anabibazō*
descend, (of nodes): *katabibazō*
contact: *kollēsis*
application: *sunaphē*
separation: *apporoia*

circumambulation: *peripatos*

degree: *moira* (See **General Note** in Paulus Alexandrinus.)
monomoiria: monomoiria (See the sections in Paulus Alexandrinus on *monomoiria.*)

crisis: *klimaktēr*

to take delight in, rejoice: *chairō*
to have dealings with: *chrēmatizō*

Such dealings evidently include any or all of the administrative or governing functions (i.e., dispositions) performed by the planetary ruler. master, lord or steward. Possibly the planet's role as spear bearer, and any configuration it enters into.

illustration: *hupodeigma*

A somewhat irregular word for 'example', that has just a trace of 'sign' or 'token.'

image: *eikōn*

Another irregular word for example that may have the sense of a visualization.

occupancy: *Epochē* See the **General Note** in the Anonymous.

under bond: *sundesmos.*

Literally, that which ties together. Evidently a more general kind of connection than conjunction *(sunodos).* See Paulus, Chapter 35.

commencement: *katarchē*
beginning: *archē*

Appendix II
Introduction to Stellar Phases

We believe that it would be useful to outline in ordinary modern language the sequence of the phases of fixed stars with respect to the Sun which form the basis of Ptolemy's *Phases*, expanding the description a bit beyond the terse one given by Ptolemy. We also will illustrate the phases with diagrams to assist the reader in getting a clearer idea of what happens at each phase.

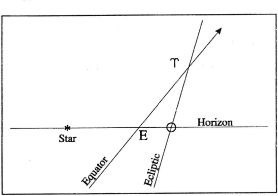

Figure 1 — True Morning Rising.

Phase 1 - True Morning Rising. We will start the cycle of stellar phases with what Ptolemy calls the "True Rising." If the star in question has very little celestial latitude, this phase corresponds very closely to the ecliptic conjunction of the Sun with the Star. However, more properly, according to Ptolemy, it is the time when the Sun and the star co-rise, i.e., cross the horizon circle together[1]. Note that the Sun is visible, the star is not. See figure 1 above.

[1] paranatellō.

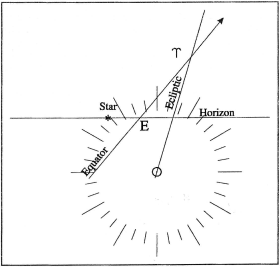

Figure 2 — Apparent Morning Rising.

Phase 2 - Apparent Morning Rising. As the Sun increases its longitude it rises later and later while the star stands more or less still. Eventually the Sun moves far enough away from the star so that the star rises before the glare of the Sun can obscure its rising. This distance, known as the *arcus visionis (A.V.)* or arc of vision, varies according to the magnitude of the star and how obliquely the ecliptic rises at the time in question. The important value is not the *A.V.* in longitude, although that is the one that concerned the ancients, but the *A.V.* in altitude, distance above of below the horizon. These are actually very complex calculations, ones which, according to Neugebauer[1], Ptolemy had to simplify somewhat. To make matters worse other factors such as the clarity of the atmosphere affect the first appearance of a star as well. However, it was usually considered sufficient to compute the theoretical Apparent

[1] Neugebauer footnote.

Morning Risings of stars. Figure 2 above illustrates a star making its Apparent Morning Rising. The rays centered upon the Sun represent the Sun's glow, although as anyone knows who has watched the horizon at sunrise or sunset, there is some glow around the entire horizon which can obscure even the risings and settings of stars that are nowhere near the Sun. This becomes important when we discuss the Apparent Evening Risings and Settings. This phase is also known as the helical rising of the star. Note that the star is visible and the Sun is not.

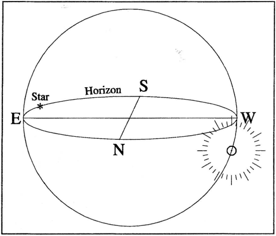

Figure 3 - Apparent Evening Rising.

Phase 3 - Apparent Evening Rising or Acronycal Rising. This is a star rising just after sunset. As the Sun increases its longitude, the star rises ever sooner before sunrise, until finally it rises in the east just after the sunset in the west. However, if a star rises close enough to sunset, its rising will be lost in the horizon glow, for, as mentioned above, there is some glow all around the horizon. As the rising time gets closer to actual sunset, the rising eventually becomes invisible. The last date on which the star can be seen rising before its rising time is too close to sunset is the Apparent Evening Rising date. Figure 3 illustrates this

relationship. Note that the star is visible and the Sun is not.

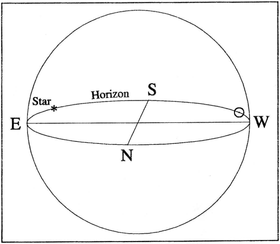

Figure 4 - True Evening Rising.

Phase 4 - True Evening Rising. This is the date on which the star is actually on the horizon in the east while the Sun is setting in the west. Somewhere about this same date the star will also set exactly at sunrise, but this date is not treated of by Ptolemy in this treatise, but he does in Book VIII, chapter 4, of the *Almagest* which is appended to this volume. Also somewhere about this date will be the oppositions in right ascension and celestial longitude. Figure 4 illustrates the True Evening Rising. The reader should note that we have placed the star and the Sun both somewhat south of the east and west points of the horizon. Bodies do not set due east or west unless they have 0° of declination. Here the Sun is visible and the star is not due to the glare about the horizon and the general brightness of the sky at sunset.

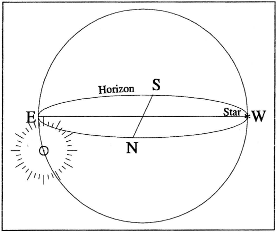

Figure 5 - Apparent Morning Setting.

Phase 5 - Apparent Morning Setting or Acronycal Setting. This is the reverse of Phase 3. The star sets at sunrise. Passing the True Evening Rising and the oppositions in right ascension and longitude, the star set more closely to the time of sunrise, until the morning glare about the horizon obscures the actual moment of setting. On this date the star will be visible as it sets in the west before the Sun comes up in the east. Figure 5 illustrates this relationship.

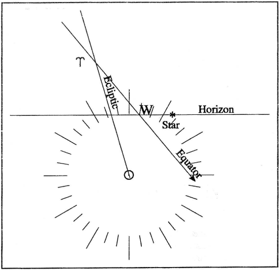

Figure 6 - Apparent Evening Setting.

Phase 6 - Apparent Evening Setting. In phase 5 above, the star, having set at *sunrise* is still above the horizon at *sunset*. As the Sun moves forward in longitude, it comes closer to the star so that the star sets earlier in the nighttime. Finally the star becomes visible only briefly after the glare has subsided. This is the Apparent Evening Setting or heliacal setting of the star. At this point the star visible and the Sun is not. Figure 6 illustrates this phase.

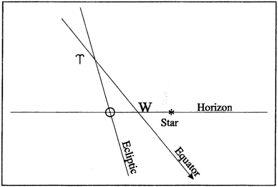

Figure 7 - True Evening Setting.

Phase 7 - True Evening Setting. This occurs after the previous phase. It is placement such that the star and the Sun both sit on the western horizon at the same. It is the reverse in this respect of the True Morning Rising. If a star is exactly on the ecliptic, this phase will occur at exactly the same time as the True Morning Rising. If the star has north latitude the date of this phase will occur after the True Morning Rising, if south latitude, then before. At this phase the Sun is visible and the star is not. Figure 7 illustrates this phase.

Extreme latitudes can alter the order of these phases significantly, especially the order of evening risings and morning settings. This is described in the *Phases.*

The outer planets, Mars, Jupiter and Saturn have phases that are like those of the fixed stars. The inner planets have quite different phases because they never move far from the Sun. A complete discussion of inner planet phases will be done at another time.

Appendix III
Table of Longest Days and Latitudes Derived from the *Almagest*

Longest Day	Latitude	Longest Day	Latitude
12h 00m	00° 00'	16h 15m	50° 04'
12 15	04 15	16 30	51 30
12 30	08 25	16 45	52 50
12 45	12 30	17 00	54 01
13 00	16 27	17 15	55 00
13 15	20 14	17 30	56 00
13 30	23 51	17 45	57 00
13 45	27 12	18 00	58 00
14 00	30 22	18 30	59 30
14 15	33 18	19 00	61 00
14 30	36 00	19 30	62 00
14 45	38 35	20 00	63 00
15 00	40 56	21 00	64 30
15 15	43 01	22 00	65 30
15 30	45 01	23 00	66 00
15 45	46 51	24 00	66 09
16 00	48 32		

Appendix IV
***Almagest*, Book VIII, Chap. 4**
translated by J.M. Ashmand

The various constellations of the fixed stars having now been duly described, their aspects remain to be investigated.

Independently of the steadfast and immutable aspects which the said stars preserve among themselves, either rectilinearly, or triangularly or by other similar forms[1], they, have also certain aspects considered as referring exclusively to the planets and the Sun and Moon, or parts of the zodiac; certain others to the earth only; and others, again, to the earth, the planets and the Sun and Moon, or parts of the zodiac, combined.

With regard to the planets only, and parts of the zodiac, aspects are properly considered as made to them by the fixed stars, when the said Planets and fixed stars may be posited on one and the same of those circles which are drawn through the poles of the zodiac; or, also, if they be posited on different circles, provided a trinal or sextile distance between them may be preserved; that is to say, a distance equal to a right angle and a third part more, or a distance equal to two-thirds of a right angle; and provided, also, that the fixed stars be on such parts of the circle as are liable to be transited by any one of the planets. These parts are situated within the latitude of the zodiac, which circumscribes the planetary motions. And as far as the five planets are concerned, the aspects of the fixed stars depend upon the visible mutual conjunctions, or configurations, made in the forms above prescribed; but, with respect to the Sun and Moon, they depend on occultations, conjunctions, and succedent risings of the stars. Occultation is when a star becomes invisible by being carried under the rays of the luminary; conjunction, when it is placed under the luminary's centre; and succedent rising, when it begins to reappear on issuing out beyond the rays.

In regard to the earth only, the aspects of the fixed stars are four in number, and are known by the common term of angles: to speak, however, more particularly, they are the oriental horizon, the meridian or mid-heaven above the earth, the occidental horizon, and the meridian or mid-heaven below the earth. And in that part of the earth where the equator is in the zenith, the whole of the fixed stars are found to rise

[1] That is to say, by the opposition, trine, &c.

and set, and to be above as well as below the earth, once in each revolution; because the situation of the poles of the equator, being in this manner on the plane of the horizon, thereby prevents the constant visibility or invisibility of any one of the parallel circles. But in other parts of the earth, where the pole of the equator is in the zenith, the fixed stars can never set nor rise; because the equator itself is then on the plane of the horizon, and circumscribes the two hemispheres (which it, thus creates, one above and the other below the earth) in such a manner, that in one revolution every star must twice transit the meridian, some of them above, others below the earth. In other declinations, however, between these extreme positions of the equator, as just mentioned, there are certain of the circles always visible, and others never visible; consequently, the stars intercepted between the first of such circles and the poles can neither rise not set, but must, in the course of one revolution, twice transit the meridian; above the earth, if the said stars be on a circle always visible; but below the earth, if on a circle never visible. The other stars, however, situated on the greater parallels, both rise and set, and are found in each revolution once on the meridian above the earth, and once on that below the earth. In all these cases, the time occupied in proceeding round from any angle to the same again, must be everywhere equal in its duration, for it is marked by one sensible revolution; and the time occupied in passing from either meridional angle to the angle diametrically opposite, is also everywhere equal; because it is marked by the half of one revolution. So, also, the passage from either horizontal angle to its opposite angle is again effected in the same equal portion of time, wherever the equator may be in the zenith, for it is then likewise marked by the half of an entire revolution; because on such a position of the equator, all the parallels are then divided, as well by the horizon as by the meridian, into two equal parts. But in all other declinations, the time of passage of a semi-circle above the earth is not equal to that of its passage below the earth, except only in the case of the equinoctial circle itself, which, in an oblique sphere, is the only one divided by the horizon into two equal parts, all others (its parallels) being bisected into dissimilar and unequal arcs. It follows, accordingly, that the time contained in the space between rising or setting, and either meridian, must be equal to the time between the *same* meridian and rising and setting; because the meridian divides equally such portions of the parallels as are above or under the earth. But in proceeding in an *oblique* sphere, from rising or setting to

either meridian, the time occupied must be unequal; and in a right sphere, equal, because the entire portions above the earth are, in a *right* sphere only, equal to those below the earth; whence, for instance, in a right sphere, whatever stars may be together on the meridian must also all rise and set together, until their progress becomes perceptible by the poles of the zodiac; while, on the other hand, in an oblique sphere, whatever stars may be together on the meridian can neither all rise together nor set together; for the more southern stars must always rise later than those which are more northern, and set earlier[1].

The aspects made by the fixed stars, in regard to the planets or parts of the zodiac, and the earth combined, are considered, in a general manner, by, the rising, or meridional position, or setting of the same fixed stars in conjunction with any planet or part of the zodiac; but their aspects are properly, distinguishable, by, means of the Sun, in the nine following modes:-

1. The first is called matutine subsolar, when the star is found together with the Sun in the oriental horizon. Of this aspect, one is called the oriental, invisible, and succedent rising; when the star, at the commencement of its occultation[2], rises immediately after the Sun: another is called the precise oriental co-rising; when the star is found in partile conjunction with the Sun in the oriental horizon[3]: another is the oriental, precedent, and visible rising; when the star, beginning to appear, rises before the Sun.

2. The second aspect is termed matutine location in the mid-heaven when the star is found on the meridian, either above or below the earth, while the Sun is on the oriental horizon. And of this aspect, one species is called a succedent and oriental location in the mid-heaven, invisible; when immediately after the Sun's rising, the star shall be found on the meridian: another is the precise oriental location in the mid-heaven when, exactly as the Sun rises, the star is at the same time on the

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[1] On this side of the equator.

[2] This is what the translator of our text refers to as "concealment." It occurs directly after the heliacal setting or Apparent Evening Setting. See page 3, note 3 in section 5 of the **Prologue**. It is not to be confused with 'occultation' in the modern sense. [RH]

[3] True Morning Rising.

rising, visible; when the star rises immediately after sunset[1]; another is the precise vespertine co-rising[2]; when the star rises and the Sun sets at one and the same time: another is the precedent, vespertine rising, invisible; when the star rises immediately before the Sun sets.

8. The eighth is named vespertine location in the mid-heaven when the star is on the meridian, either above or below the earth, while the Sun is placed on the occidental horizon. Of this aspect, one kind is called a visible vespertine location in the mid-heaven; when the star is found there immediately after sunset: another is the precise vespertine location in the mid-heaven; when the star is found there at the moment of sunset; another is the vespertine precedent location in the mid-heaven, invisible; when the star arrives there immediately before sunset.

9. The ninth aspect is called vespertine setting; when the star, together with the Sun, is on the occidental horizon. One form of this aspect is the vespertine, succedent and visible setting; when the star, at the commencement of its occultation, sets immediately after the Sun[3]: another is the precise vespertine setting[4]; when the star sets at the same moment with the Sun: another is the precedent, invisible setting; when the star, before it emerges from its occultation, sets before the Sun.

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[1] Apparent Evening Rising.

[2] True Evening Rising.

[3] Apparent Evening Setting.

[4] True Evening Setting.

Appendix V
The Alexandrian Calendar

The Alexandrian Calendar was a reformed version of the old Egyptian Calendar. The old calendar had 12 months of 30 days with 5 epagomenal days, a kind of extended set of "leap days" to fill out the year with 365 days. However, the year being closer to 365¼ days, the old calendar slowly wandered through the year, giving rise to an extremely long cycle between dates on which the star Sirius would helically rise on the same calendar date. This was the famous Sothic Cycle of 1460 years.

After Julius Caesar reformed the Roman calendar the Egyptian was similarly reformed adding a leap day every four years in the same way that is familiar to us. This the Alexandrian Calendar. Its year is the same exact length as the Julian Calendar year. And like the Julian Calendar, it too has gradually fallen behind the seasons[1].

Coptic	Julian
1 Thōth	29 Aug.
1 Phaōphi	28 Sept.
1 Athyr	28 Oct.
1 Choiak	27 Nov.
1 Tybi	27 Dec.
1 Mechir	26 Jan.
1 Phamenōth	25 Feb.
1 Pharmouthi	27 March
1 Pachōn	26 April
1 Payni	26 May
1 Epiphi	25 June
1 Mesori	25 July
5 Epagomenal Days	24 Aug.

The new year begins on the Julian day August 29, except for leap years when it falls on Aug. 30. The leap day is created by adding 1 day to the 5 epagomenal days to make 6.

The Table gives the months in the Alexandrian Calendar with their Julian Calendar equivalents. There are various spellings for the months.

[1] It is still in use in the Coptic and Ethiopian Churches.

Appendix VI
Special Lexicon of Greek Meteorological Terminology in Ptolemy's *Phases* and Geminus' Register

The following words are given in the *Greek* alphabetical order according to the letters of which these are the transliterations.

akrisia — indecision
alkuonis — "winter days during which the halcyon builds, and the sea is calm."
apēliōtēs — due east wind
amixia — unblendedness, purity
astrapē — lightning
akrasia — ill mixture (ill temperature)
aparktias — northern or arctic wind
argestēs — northwest wind
ataktos — irregular
ataxia — irregularity
boreas — north wind
brontē — thunder
brochē — inundation, rain
dusaeria — bad air
epombros — pouring rain
eudia — fair weather
euros — southeast wind
ephuō — to rain upon, rain after
zephoros — due west wind
kataigis — squall, hurricane
katastasis — settling down, condition, state
kauma — burning heat
thuella — hurricane, squall
thuellōdēs — stormy
kauma — burning heat
lips — southwest wind
labros — boisterous
leukonotos — the south wind which cleared the weather
metopōron — literally, after the *opōron*; the fall season.
nēnemia — stillness of the air, calm

niphetos — falling snow, snowstorm
notia — damp or wet weather
notos — south wind
ombros — thunder-storm
omichlē — fog
opōra — the part of the year between the rising of Sirius and Arcturus; late summer, or autumn, but distinct from *pthinopōron* or *metopōron* (both names for fall).
pachnē — frost
peristasis — circumstances or veering around?
poikilos — literally, many-colored; metaphorically, changeable
pnigos — stifling
prodromoi — literally, running before; the winds before the Etesian winds
puknos — lit. close, constant, or frequent
huetos — rain
huetia — rainy weather
sustrophē anemōn — whirlwinds
tarachōdēs — uncertain, confused, disordered
phthinopōron — literally, the waning of the *opōra*; the fall season.
chalaza — hail
cheimōn — stormy weather
cheimerios — wintry
chelidōn — swallow (the bird)
psakas — drizzle
psuchos — the cold
psuchros — cold

Appendix VII
The Modern Designations of Ptolemy's 30 Stars

Bright star of Lyra . . . . Vega, Alpha Lyrae
Arcturus . . . . Alpha Boötes
Heart of Leo . . . . Regulus, Alpha Leonis
Tail of Leo . . . . Denobola, Beta Leonis
Bright star of Hyades . . . . Aldebaran. Alpha Tauri
Procyon . . . . Alpha Canis Minoris
Following shoulder of Orion . . . . Betelgeuse, Alpha Orionis
Spica [Virginis] . . . . Alpha Virginis
Common to Eridanus and foot of Orion . . . . . . Rigel, Beta Orionis
Dog-star . . . . Sirius, Alpha Canis Maioris
Bright star southern half of the Pisces
. . . . Fomalhaut, Alpha Piscis Australis
Last star of Eridanus . . . . Acamar, Theta Eridani
Canopus . . . . Alpha Carinae
Right fore frog of Centaur's hoof . . . . . . Toliman, Alpha Centauri
Bright star of Perseus in Ptolemy
. . . . Either Alpha Persei or Algol, Beta Persei
Following shoulder of Auriga . . . . Menkalinam, Beta Aurigae
Bright star of Cygnus . . . . Deneb Adige, Alpha Cygni
Bright star of Corona . . . . Alphecca, Alpha Coronae Borealis
Head of the preceding Twin . . . . Castor, Alpha Geminorum
Head of the following Twin . . . . Pollux, Beta Geminorum
Star common to Pegasus and Andromeda
. . . . Alpheratz, Alpha Andromedae
Bright star of Aquila . . . . Altair, Alpha Aquilae
Star in the preceding shoulder of Orion . . Bellatrix, Gamma Orionis
Bright star of Hydra . . . . Alphard, Alpha Hydrae
Bright star of northern claw of Scorpio . . . . . . N. Scale, Beta Librae
Middle star of belt of Orion . . . . Alnilam, Epsilon Orionis
Antares . . . . Alpha Scorpii
Star down on knee of Sagittarius . . . . Rukbat, Alpha Sagittarii
Capella . . . . Alpha Aurigae
Bright star of southern claw of the Scorpion . S. Scale, Alpha Librae

For more information see Appendix II of Anonymous of 379 A.D. *Treatise on the Bright Fixed Stars.*

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